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THE NAVAL AVIATION SAFETY REVIEW APRIL 1961

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THANKS!

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APPROACH
The Naval Aviation Safety Review

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Our Product is safety, our process is education, and our profit is measured in the preservation of lives and equipment.

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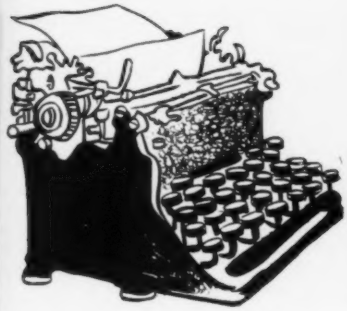


Letters

No Tickee—No Payee

On 11 March 1598, Op Nav Inst 3760.8 CH-3 was promulgated for flight offices to maintain a record of the issuance of flight certificates.

This office is so situated that it handles a very large number of transient aviators from overseas and within ConUS. After almost three years it seems that operations personnel would know of the requirement of CH-3. But no, we still have pilots wanting a flight certificate who have left their former units without a flight certificate or only a log-book entry.

To help these aviators, this office has been filling out a 3760-37 and returning it to the pilot's unit for signature, which is readily returned, verified.

For the past nine months a copy of CH-3 has been sent along with form 3760-37 to various units begging them to spread the word.

A conspicuous note in APPROACH seems an excellent means of reaching all operations sections of the Naval Establishment and pilots. "No tickee, no payee." Any help by you to reach these lazy or blind operations people would be sincerely appreciated.

E. P. STAMFORD, MAJOR USMC

Station Flight Officer
MCAS, El Toro

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request. Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. Views expressed are those of the writers and do not imply endorsement by the U. S. Naval Aviation Safety Center.

Troubleshooters

Sir:

When one of VA-93's A4D-2N "Skyhawks" was rolled into the barn for a routine check, nothing appeared out of the ordinary except for a slight list to port. Closer investigation by the plane captain, R. A. Zanolini, AN, showed JP-4 leaking out of the port drop tank overflow valve.

Careful searching brought to light the jammed float valve you see in the photograph. A piece of aluminum welding had somehow dropped into the valve, wedging it open so that a small amount of gas could trickle through. This, then, was why a pilot "thought he had difficulties" in transferring fuel on a previous hop.

It was a small thing . . . and in the hurry to get the planes out for an early launch, it might easily have been shrugged off as negligible. Thanks to Zanolini, and to A. J. Rios, ADJ3 who sized up the situation with Zanolini, the incident remained "a small thing." More exactly, a VA-93 aircraft did *not* roll and drop off the end of the runway due to asymmetrical fuel loading . . . and a pilot's life was saved.

DOUG PEASE, ENS

VA-93, FPO San Francisco

Correct Address, Please

Sir:

Please send us safety posters as listed in Aeronautical Publications Index NavWeps 00-500.

TECH LIB

NAAS, Chase Field

● Material requested has been shipped. The delay is regretted. Your request was addressed incorrectly and went to Naval Supply Center. Upon checking NavWeps 00-500 it was found that an error had been made in printing NASC's address and corrective action has been taken. The correct address for procurement of this material is:

Commander, U.S. Naval Aviation Safety Center
NAS, Norfolk 11, Virginia
Attn: Literature Dept.

Book Review

Sirs:

The following quotation is extracted from page 70 of Guy Murchie's book "Song of the Sky" (publishers—Houghton Mifflin Co., Boston):

"Most flights are uneventful only because someone planned every detail carefully—someone who, like the chess player, knew the game

and could see several moves ahead. That is the way fear is conquered; not by thinking of pleasanter things, by letting George worry about it—but by facing the worst, becoming familiar with disaster and death until you've got it licked at every turn."

Incidentally, I recommend the book (circa 1954). For an airman in love with his trade, the book is like talking to an old friend.

LCDR O. A. PETERSON

VAW-12—NAS Quonset Point

Chopper Formation—What Purpose?

Sir:

A recent article in Crossfeed regarding helicopter accidents while flying formation has finally propelled me into asking a question. Why do helicopters fly formation? I have over 1000 hours in the machines and love it, but I have always wondered of what practical value is a formation of helicopters. I have flown in a V-slot for parade purposes and think it looks great but—nowhere to go!

ANYMOUSE

● **Any comments?**

Transferring?

If you've transferred recently, or moved locally, and have a personal *subscription* to APPROACH, please send your change of address to Supt. of Documents, Government Printing Office, Washington 25, D.C.

Special Delivery

Sir:

Enclosed is a copy of our acknowledgment of receiving cheese "promised" by Headmouse (APPROACH *issues of Sep '60 and Feb '61*)!

Mr. Elias Codd
Codd's Delicatessen
Norfolk, Virginia

My dear Mr. Codd:

Please accept the gratitude of Mr. Morrison and myself, for the wonderful assortment of imported cheeses which was presented to us by my Commanding Officer, CDR P. H. Durand, in behalf of "Headmouse."

Forwarded with the cheese was a letter from APPROACH magazine telling where the cheese originated and of your activities as a savings bond salesman and patriot. I am enclosing a clipping from the Moffett News with a picture of Commander Durand presenting your cheese.

Mr. Morrison and I wish to express our sincere thanks and appreciation for the fine imported cheeses, which we are enjoying very much.

I also wish to send my apologies for not writing you sooner thanking you. I went on leave immediately after the presentation of the cheese, as my wife was delivering a new "prospective Anymouse," a healthy eight pound girl.

Thank you again, we remain.

Sincerely yours,
A. E. LENTZ, AE1, USN
ED MORRISON
NAESU Representative

VA-125, NAS Moffett Field, Calif.

REAPING REWARD—A. E. Lentz, AE1, receives imported cheese from CDR P. H. Durand, on behalf of Headmouse for contribution of A4D safety tips. Lentz's reward, a six-month supply of imported cheese from Elias Codd's Delicatessen in Norfolk, was presented before All Hands by CDR Durand, skipper of VA-125 at Moffett Field.

Want Decimal Equivalents Poster

Sir:

A poster of decimal equivalents similar to charts appearing in commercial aircraft handbook standards (copy enclosed) would serve a real need in our shops for quick reference. Information is desired as to a source for this kind of material.

NARTU ADS AND AMS

● **Aircraft Structural Hardware Manual NavAer 01-1A-8, p 1-17 contains this information. While this manual cannot be considered a handy reference of the type desired in shops, it is a source. NASC would like to hear from others to justify printing such a poster.**

Cut APPROACH In!

Has information in APPROACH magazine ever helped you prevent an accident — prevent an injury — or better handle an emergency?

If so, and you have not reported it to NASC already, it is particularly important that you do so. This information is vital to both editorial direction and fiscal support of the magazine.

Transient Service

Sir:

I was certainly glad to see your pitch on Transient Service (February '61). Hope that several of our air patch leaders take it to heart. I'm enclosing an informal report of some experiences which you may find slightly familiar . . .

On a recent flight from Norfolk to the West Coast and return, it was found that the transient line facilities of many of our bases leave a lot to be desired. To list only a few of the most glaring (or irritating) discrepancies observed:

It was found that it is extremely difficult to obtain a hot meal outside normal working hours at most air stations;

The lack of adequate flight planning facilities—some places there is room for only about three pilots to work at one time and this not without crowding;

General lack of Decoded NOTAMs and necessary publications such as the Airman's Guide;

General shortage of some FLIP charts (particularly those of the local area);

Almost complete lack of SIDs which were required by OpNav Inst 3722.23 to have been promulgated and approved by 30 June 1960;

Generally poor weather briefings outside normal working hours (except at NAS Memphis where the briefing is considered to be outstanding);

Frequent lack of knowledge of and poor material condition of ground handling equipment such as airstart units and NC-5s—at one station the line crew reported that all three wheel pins were pulled but only handed the pilot two (the red streamer had torn loose and the man, therefore reported that the pin had been pulled);

Also noted that many stations were completely unfamiliar with the T2V to such extent that at one stop we directed the transient line crew to leave the aircraft unserviced until morning when presumably someone would know where the single-point fueling connection was located and the proper procedures to prevent rupturing the tanks.

One more final complaint—the pilot who loses or forgets his flashlight is really up a creek to navigate at night in this modern Navy as only one station was found to have flashlights, bulbs or batteries available for sale or issue; in fact, one station did not even have flashlights available on that particular night for the line crew and taxi directors.

TRANSIENT MOUSE

Sir:

Not too long ago a transient F8U-2 landed here at Navy Memphis for servicing. The pilot requested full service, filled out the usual transient line forms and disappeared to the snack bar. Meanwhile, the refueling crew was called and they commenced fueling the aircraft. However, the fueling switches in the cockpit were such that only the main cells were getting pressure fuel which could possibly rupture the cell from overpressure. Fortunately, this incident was caught in time.

Unfortunately, there are many transient pilots who literally pull into the chocks, tell the line personnel to "fill 'er up" and then disappear until ready for preflight. Navy Memphis receives many transient aircraft, particularly fleet type aircraft that have integral fuel systems. It is difficult for us to insure that cockpit switch and fuel switches are in order prior to refueling. It certainly is not advisable to have line personnel throwing switches in cockpits particularly when they are not familiar with them.

We are attempting to solve this problem of safe and proper refueling operations by the use of signs and a rubber-stamped reminder on service forms hoping this will alert the pilot to his responsibility, particularly the single engine jet pilot.

Perhaps other stations may have this problem of proper servicing—perhaps not. In any event, there are pilots on cross-country flights who leave all the servicing to the transient line crew. This is not good. Records still show accidents occurring because of inadequate servicing. It is respectfully suggested that a reminder be printed in APPROACH in order to reiterate a pilot's responsibility in this area.

O. D. KELLETT, CDR
Operations Officer

NAS, Memphis

Sir:

I enjoyed reading the February ('61) issue from cover to cover as always. Although I am now deskbound, my previous duty in a Jet Training Unit afforded me the opportunity to take many cross-country flights in jets. Although the article entitled "Transient Service" had many good ideas, I feel it was unfair. Although the Operations Duty Officer does not have a station wagon to drive out to meet transient pilots, it usually is not necessary as your aircraft is parked close to Operations and not 10 miles out in the boondocks.

As a general rule I have found Navy transient crews to be more courteous and efficient than transient crews at Air Force Bases. I also prefer the Navy system of an office or desk in or near Operations where the pilot fills out all the necessary forms and stubs for service and then picks up the completed forms at the same place. I have spent many anxious minutes at various Air Force Bases trying to track down my completed stubs which were supposed to be in the aircraft.

Memphis, New Orleans, Pensacola and Dallas all receive heavy transient traffic, especially on weekends, and never have I received anything but fast, reliable, courteous service at any of these stations. As a matter of fact, after spending five hours trying to get four F9F-5s fueled at an Air Force Base one Friday afternoon, I began to go a little out of my way to land at a Navy Field.

P. E. O'GARA, LT
ComFAirMed—Staff

Navy 510, FPO, N. Y.

Fuel Facts

Sir:

. . . Page 57 of Dec '60 APPROACH under the title "Sniff test!," mentions "415 octane fuel" and "115 octane fuel." Even those of us with little knowledge of chemistry know that 100 is the highest octane and numbers greater than that are grade or performance numbers. Furthermore, 115/145 is the purple fuel having a lean performance number of 115 and a rich performance number of 145. (I assume you already know this, but I include it for the benefit of the uninformed.) Likewise 100/130, which is green, has a lean performance number of 100 and a rich performance number of 130.

I cite as my authority NavAer-06-5-501 also known as USAF T.O. No. 06-5-4 "Aviation Fuels and Their Effect on Engine Performance."

R. D. BORDEN, MACH W-1 USCG
Navy 138, FPO, N. Y.

Quality Control

Selected concepts, theories, philosophies and general principles as

Requests to NASC for background material to implement quality control concepts in keeping with BuWeps Instruction 5440.2 indicate that more specific, standardized and detailed information for training quality control people is needed. Typical of these requests is the letter from the commanding officer of HU-4 (Headmouse, page 46). Preparation of such information is considered to be a matter for the technical bureaus and accordingly, the matter has been referred to BuWeps. BuWeps Notice 5440 advises that the Instruction is being revised embodying recommendations from representative fleet activities.

Meanwhile, reports from pioneers of this field indicate gratifying results have been achieved using their systems of quality control. Pending revised instructions from BuWeps APPROACH passes these reports on to you for information and possible use. It is believed that the policies can be adapted to fit specific needs of your squadron.

as practiced by operating units.

A Word from CNO

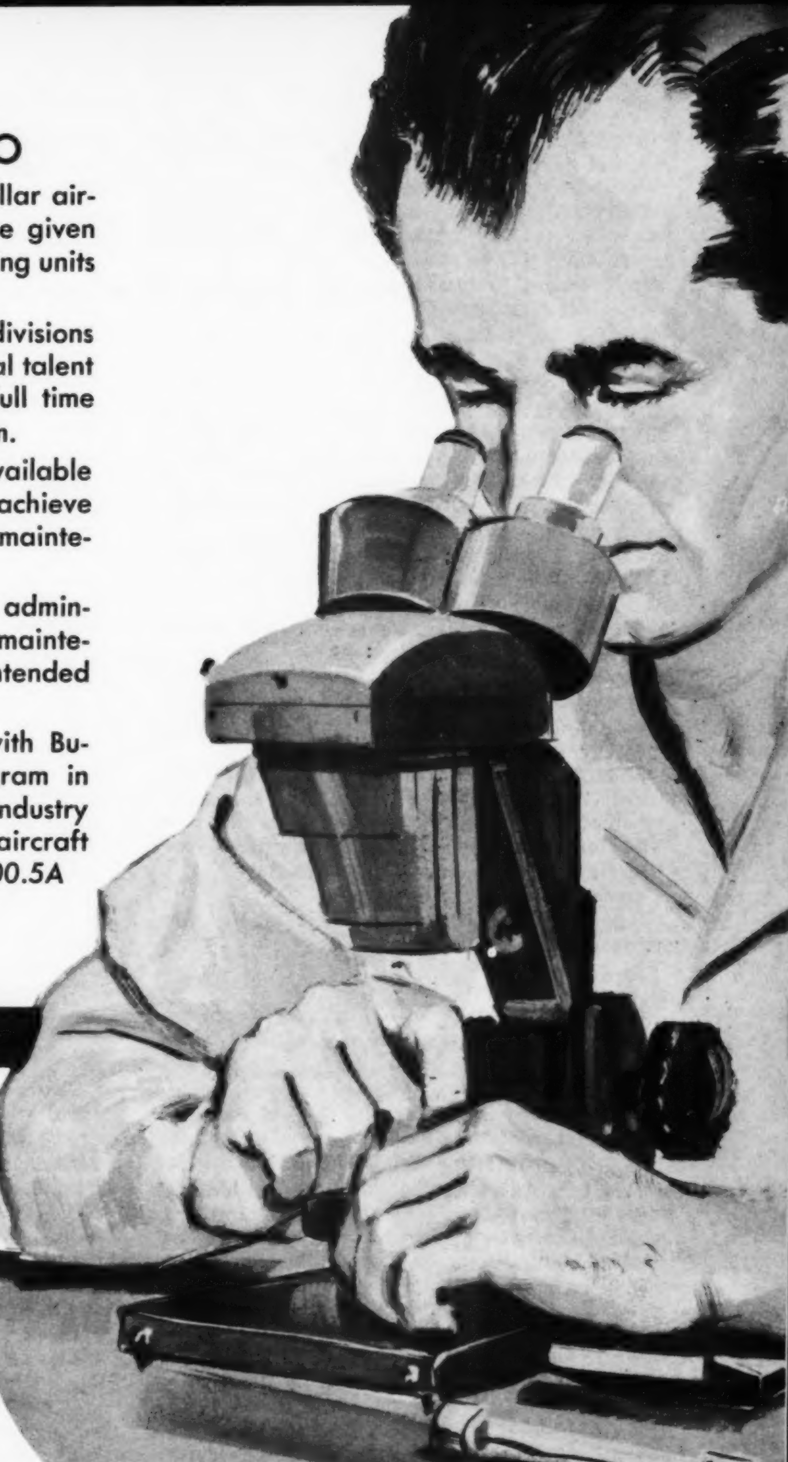
"In an era of multi-million dollar aircraft vigorous attention must be given to maintenance matters. Operating units and activities must:

► Insure that quality control divisions are staffed with the best technical talent to implement and supervise a full time rigorous quality control program.

► Make maximum use of available maintenance training courses to achieve the highest possible state of maintenance capability.

► Insist on firm maintenance administrative procedures to insure maintenance directives reach their intended user and *are implemented*.

► Require full compliance with BuWeps Material Reliability Program in order to provide BuWeps and industry with the tools for improving aircraft maintainability."—*CNO Inst. 5400.5A*



Continued next page

VS-30: Quality Control—

Improves Material Reliability, Corrects Faulty Workmanship

THE aircraft of today is a more complex flying machine than ever before. At best its availability as just a flying machine is in the vicinity of 75 percent. As an aircraft fully capable of accomplishing its mission, 50 percent availability is a fairly honest, perhaps a little high, estimate. There are many reasons why these figures aren't higher, but two of the main reasons are faulty workmanship and faulty material.

There are many things being done to raise these figures. The Quality Control System set forth in this report suggests action that can be taken on the squadron level to improve the caliber of workmanship, discover areas of material difficulty, and make recommendations for improvement.

Quality Control can be defined as that function which insures that the product is held, within specified limits, to definite and uniform standards. The objectives of Quality Control are twofold:

to improve material reliability and

to correct faulty workmanship.

The framework for accomplishing these objectives is:

- ► Inspection
- ► Records
- ► Analysis
- ► Recommendations.

It can be said no simpler; these are the four vital links in accomplishing the task of Quality Control.

Inspections

The term Inspection as used in the ensuing paragraphs refers to an inspection to determine the quality and completeness of work performed and material condition.

The control of quality is the duty of each division and each individual. It is the task of the Quality Control Division to aid the divisions in performing this duty. The job of the division chief has increased in difficulty with the ever-increasing complexity of the aircraft. More and more technical specifications and requirements must be met. It has reached the point where he must supervise his men and have the memory of an electronic brain to insure that his shop complies with all technical requirements. This latter job can be accomplished by assigning a qualified man the responsibility of being familiar with all technical requirements and directives. It will also be his responsibility to insure their compliance. This man is the Quality Control Inspector.

The job of the Quality Control Inspector is a large one and if done properly will require his full attention. It is therefore felt that this man should be assigned on a full time basis. The following are some of his duties:

(1) Review all completed work and sign the Work Order prior to the job being considered completed.

(2) Insure that the completed work has been done in accordance with Navy Standards and Safety of Flight requirements.

(3) Be cognizant of applicable directives and instructions, determine if they are complied with and that they are adequate in scope and detail.

(4) Inspect not only the actual work performed but also check for operability of elements of the aircraft which may have been disconnected or torn down in order to perform such work.

(5) Perform inspections on incoming parts, defective parts, reworked parts, check completions, tools, work equipment and completions of SAMIs and CAMIs.

(6) Screen and sign all FURs for his particular shop.

(7) Make recommendations concerning test flights, parts conditions, operating procedures and maintenance procedures and methods.

(8) Submit an Inspector's Discrepancies Log daily. Indicate on this form all deviations from established standards of workmanship and material conditions.

(9) Maintain for his shop a separate log on each aircraft which contains a record of work orders and discrepancies. The inspector shall refer to this log prior to inspecting a job to obtain the aircraft history. This log should aid in diagnosing trouble and preventing recurring gripes.

The various division Inspectors will be organized in a division headed by the Quality Control Officer. By doing this the Inspector can be a

free agent and need not feel he is checking the work of his immediate superior. The Inspectors should be highly qualified men who are respected in their rate.

This is the function of Inspection. The test of its thoroughness will be the dependability of the items repaired.

There are no figures available to compare the manhour cost of this system with that of a system where inspectors are appointed to perform inspection duties in addition to their regular work. This system requires his full time and he is no longer available to the shop for job assignment. A rough estimate would be 50 percent of his time spent in performing shop work when working as a part time Inspector. However, *it is extremely difficult for any man to serve two masters and do his best for both.* Again manhour figures aren't available but it is estimated that the work performed by a full time inspector can save enough manhours, by preventing recurring discrepancies and detecting faulty workmanship and material, to more than offset the loss of his on-the-job manhours.

Records

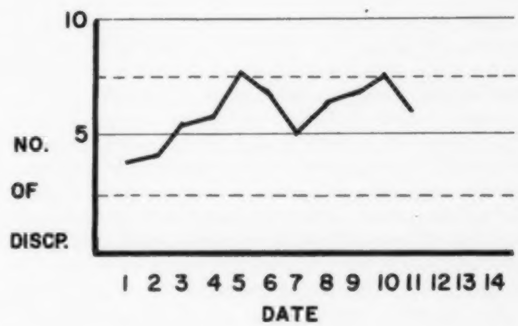
This function of Quality Control will be of little use unless it is accurately maintained and used. The following are only a few of many records that could be kept to aid in the Analysis of Maintenance difficulties:

(1) Completed flight schedules.
(2) Daily availability reports; this will include the new hourly aircraft status reports.
(3) Failure, Unsatisfactory and Replacement reports (FURs).
(4) Recurring discrepancies file.
(5) Inspector's discrepancy logs.
(6) Disassembly and Inspection Reports.
(7) Completed work orders.
(8) Pilots' weekly inspection forms.
(9) Test flight check sheets.
(10) Quality Control Trend Analysis files.

Individually they mean little but collectively they can indicate and reflect the pulse of the maintenance process. Most are self explanatory. The one to be discussed at length is number 10, Quality Control Trend Analysis Files. To understand these records it is necessary to point out some of the principles on which these records are based.

The underlying causes of faulty workmanship and material failure can be classified into either of two categories; Chance Variations or Assignable Variations. Chance variations occur in a random manner and cannot generally be associated with any continuing cause, i.e., propeller being hit by foreign object. Variations occur in a definite pattern and the source of these variations can usually be found and corrected, i.e., faulty overhaul or manufacture of a series or parts. It is desirable to control both of those factors, but because of the nature of chance variations, control is essentially impossible; however, they can be detected and an estimate made of their future occurrence. The problem therefore resolves itself into one of determining the assignable variations.

The word control implies retaining variables within set limits. If we are to have quality control in the maintenance of aircraft we must establish a basis of comparison and allowable limits of variation for the components and systems in the aircraft. The chart shown below represents a control device that provides a visual representation of the basis of comparison and the allowable limits.



The solid line drawn in at 5 represents the average number of daily discrepancies. The dotted lines at 2.5 and 7.5 are the limits within which the total number of daily discrepancies will occur when things are normal. When daily discrepancies occur above 7.5, assignable variations have occurred that can be traced and corrected.

If the discrepancies that occur to all aircraft in custody are totaled daily and entered on a chart of this sort the result will be a daily presentation of the maintenance situation. This presentation will indicate the days that discrepancies are excessive. However, it will not indicate the specific sources of the trouble. If a series of charts similar to those of this report were kept, the maintenance situation for each shop, each aircraft and each piece of equipment could be found daily. When the daily values in the overall chart go beyond limits they can be traced directly to the particular piece of equipment causing the excessive trouble.

The first step in establishing a system of this sort is to determine the value of the basis of comparison and the limits. To do this it is necessary to select a sample period of time that is representative of normal aircraft operation and determine the average number of discrepancies that occur daily to the aircraft. By obtaining the average number of daily discrepancies over a fairly long period of time, chance variations can be eliminated and the basis of comparison will be the result of assignable variations. To find the limits it is necessary to use the same sample period of time and determine the average deviation from the basis of comparison. This value when added to the basis of comparison will be the limit within which the total number of discrepancies must be held. When the daily total falls beyond this limit then "something" has caused excessive variation. No longer is quality being controlled and steps must be taken to bring the discrepancies back within limits.

This is all theory and even the theory hasn't determined what the "something" was that caused variation beyond limits. To put the theory to work and introduce all possibilities into the problem, the system as used in VS-30 will be outlined.

A six-month sample period was chosen. During this period the squadron spent approximately three months based ashore and three months aboard ship.

The completed Work Order and Accomplishment Records (Form 5ND 4514) during this period were used as the source from which the number of discrepancies per day was determined. It was felt the work order was the best source of information as no work is done on the aircraft until the Planning Officer issues a work order. These work orders were placed in categories with codes. The codes segregate the equipment in the aircraft and the airframe as nearly as possible in accordance with the Handbook of Maintenance Instructions. This gives greater ease in determining the particular item and obtaining further information should difficulty arise.

These work orders were then logged on work sheets. From these sheets the total number of discrepancies per day was determined. These totals were added together and this total divided by the number of days involved. The resulting figure is an average known as the Mean.

A Chart was then made similar to Figure A. The horizontal scale represents days; the vertical scale represents the number of discrepancies. The Mean was then plotted as a straight line as it was to be the base of comparison. The number of discrepancies per day was then plotted and amount they varied from the Mean recorded. An average of these values was then taken. The resulting value is known as the Mean Deviation; the Mean Deviation being the average variation from the Mean.

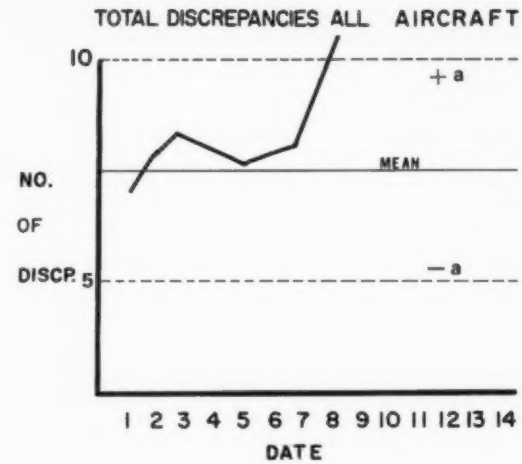


Fig. A

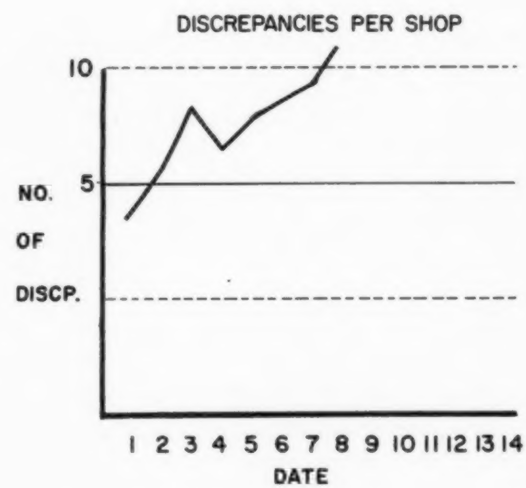


Fig. B

The Mean Deviation was plotted as both a positive and a negative value in order to obtain the limits within which all normal daily discrepancies will fall. These values are represented as plus or minus "a" on the charts above.

The necessary tools for quality control are now available. The Chart in Figure A above will give an overall picture of the Maintenance situa-

DISCREPANCIES PER EQUIPMENT

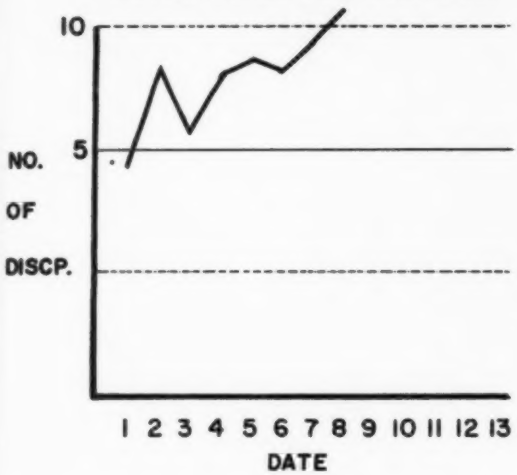


Fig. C

DISCREPANCIES PER AIRCRAFT

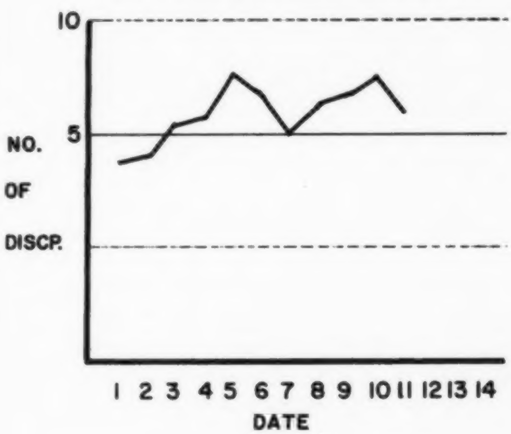


Fig. D

tion on a daily basis. This is helpful information and can indicate trends in maintenance difficulties but it still doesn't answer the question of what the "something" is that causes the overall situation to go beyond established limits.

Fig. B represents a chart constructed similar to the Chart in Fig. A. This chart shows the situation in the various shops. Fig. C is a chart constructed in the same manner and indicates the status of each item in the coded groups. Fig. D represents the number of discrepancies occurring daily to each of the aircraft. Figures B, C, and D are indicated as one chart. However, there will be one such chart for *each* shop, *each* item and *each* aircraft. The number of discrepancies shown on these individual charts will be much lower than the totals pictured here. The actual file for VS-30 contains 148 charts.

To further explain the system, notice in Fig. A that on the 7th the total discrepancies were approaching the upper limit and on the 8th actually exceeded the limit. Once again "something" was causing trouble but this time it is possible to determine what. The shop chart also indicates trouble on these dates. Let us assume this is a chart for the power plants shop. Analysis would then be made of all the items that are maintained by that shop. The equipment chart also indicates trouble on these dates. Let us further assume this chart is for item 5-120, Ignition System. At this point it is known that the Ignition System is not functioning as it should. Analysis of the charts on the individual aircraft may not indicate any particular aircraft. By looking back at the work orders for these days it may be found that six sets of spark plugs were installed on these particular days. Further investigation will determine why they failed. Perhaps all six sets of spark plugs were from a lot of faulty manufacture. Daily upkeep of the charts and analysis should have indicated as early as the seventh or even the sixth that if allowed to continue serious trouble would arise.

There are two factors that will influence the daily total of discrepancies and give erroneous results. One is the fact that with more aircraft more discrepancies will occur, and the other is the more flights that are flown the more discrepancies will result. It is important to compare each day on the same basis. For this reason the average number of flights per day (9) and the average number of aircraft (20) must be determined. All the computed averages and limits were based on these figures. Space is provided on the daily work sheet for an Aircraft Time Factor to be multiplied by the total for each discrepancy, the product is the chart value. The Items are arranged according to the shops maintaining the equipment. The addition of their chart values yield, the chart value of the individual shops. The total of the shop values gives the value for the overall chart. The chart value is found by the following formula:

$$\frac{9}{\text{No. of Daily Flights}} \times \frac{20}{\text{No. of Aircraft Available}} = \text{A/C Time Factor}$$

The number of aircraft available figure excludes aircraft undergoing periodic inspection, engine change, AOCP, overhaul, etc.

The organization necessary for a system such as this isn't as complicated as would appear at first glance. A carbon copy of the previous day's work orders can be coded by the Quality Control Assistant each morning. From these a daily work sheet would be made; the computations completed and the appropriate entries made on the various charts. This requires a maximum of three hours for one man each day.

Analysis

This function of Quality Control involves reviewing the various charts, noting the values that are excessive and searching for causes of these variations. The search will involve all of the previously mentioned records until a logical answer can be found. To observe these records as cold facts and try to reach a conclusion would be rather difficult. The Quality Control Officer can keep his finger on the pulse of the maintenance problem by reviewing and passing final approval on all completed work orders and at the same time take some of the coldness out of the facts.

This review brings to light such things as the lack of operator knowledge erroneously grounding an aircraft that is working normally. One solution to this problem is the Pilot's Discrepancy Report which is prepared and sent to a pilot when it is noted by his discrepancy that he lacks a complete knowledge of the aircraft component in question.

Conducting a Test Flight Program and a Pilot's Weekly Inspection are further methods of analyzing various components, obtaining information and determining if the Quality Control System is effective.

Recommendations

The fourth function of Quality Control is a summation of the information gained by the system and forwarding it to those who can best use and profit most by the knowledge gained. The following are some of the forms that these recommendations may take:

(a) Recommendations to the Maintenance Officer.

(b) FURs.

(c) Urgent AmpFURs.

(d) Recommendations to and conferences with Division Officers and Chiefs.

(e) Squadron and Maintenance Department Instructions.

(f) Training of Inspectors.

(g) Recommendations for Aircrew Training.

(h) Pilot Discrepancy Forms.

(i) Liaison with Safety.

(j) Originate correspondence with higher authority and other activities.

(k) Originate Work Orders.

(l) Information to factory representatives.

These are some of the many ways that Quality Control can act. The important thing is that the information gained and known to the Quality Control Officer be passed on to others.

Summary

The big problem is unreliability of aircraft due to material deficiencies and poor workmanship. Part of the solution is a system of Quality Control to pinpoint the troubles — a system which would include inspectors who are skilled in their rate and trained in the complete picture of quality control so they may eliminate faulty workmanship by discovering it before it has a chance to cause difficulty. This system would include records that contain information from various sources waiting to be added together to indicate where the greatest difficulty lies and why it is there. The final function of this system is to analyze these facts and point them out to others.

Quality Control is a big but vital job, full results will not appear immediately and even when they do occur they may be so gradual their weight isn't realized. As previously stated the test of success in Quality Control will be the dependability of work completed. It is difficult to find a yard stick to measure the degree of dependability attained. One of the best indications readily available is aircraft availability.

Quality Control was initiated in June 1959. The average monthly availability during the ensuing period June through October 1959 of 72.8 percent compares with 61.4 percent for the previous five months, January through May. A low of 66.3 percent in July compares with the highest in the previous period of 66.5 percent in April. The 72.8 percent compares with 53.7 percent during June through October 1958 when Quality Control wasn't in use.

This is an indication of what Quality Control can do. It need not be limited to one particular type of aircraft or maintenance situation. The system described herein can be used by any squadron having a Quality Control Officer and an Assistant. The framework of Quality Control outlined in this report is not difficult to organize and set in motion. To be successful it must include all four functions; Inspection, Records, Analysis and Recommendations.

AEW-11:

Quality Control—

Provides Maintenance Information, Source of Recommendations

WHAT IS Quality Control?—To the personnel not directly concerned with the maintenance of naval aircraft, Quality Control may have the ring of a large civilian industrial organization. It is, however, an extremely important condition necessary in the operating squadrons of the Navy. This was realized by BuWeps planners and a new division was created by BuWeps Instr 5440.2. This Instruction listed only what such a division was intended to achieve—the personnel used, methods and procedures were left to the discretion of each command: It did include a request for recommendations from the various types of activities.

A Quality Control Division has been formed and a nucleus of senior inspectors assigned. Each production/service division has its qualified and experienced senior personnel designated as inspectors. Every man in the division has his own individual contribution to the control of quality and safety every time he reports for work.

The fundamental purpose of the division is twofold: First, to provide the Maintenance Officer with an information service which can lead to improving the safety, availability and overall material quality of squadron aircraft. Also, to provide him with data and recommendations for changes in material and procedures to be forwarded to senior commands. Second, the Quality Control Division is to create and provide training and guides for the maintenance personnel which will assure that they are familiar with current functions and procedures approved (or directed) by the designers, manufacturers and senior commands.

Continued next page

The division inspectors, senior and experienced in their specialities, conduct the inspections of the individual jobs and instruct junior personnel in the proper procedures to be followed, materials to be used and precautions to be observed.

Quality and safety cannot be inspected into a job, it must be *worked* into it. Therefore, each man in the production divisions, through his own efforts in performing a job, completely and in accordance with approved procedures, has an obvious effect on quality, availability and safety. The individual mechanic/technician is the one who actuality creates these very important conditions in naval aviation.

To personnel who have tendencies to be slipshop in their work or who prefer to rely entirely on their knowledge of past experiences, Quality Control may be looked upon as a technical police force aimed only at interfering with their freedom of action and/or with trying to put the individual's neck in the proverbial noose.

To the mechanic/technician with the initiative and interest to give his best possible to the Navy and to his shipmates on the flight crews, Quality Control, in the form of his division inspectors or the Quality Control Division's senior inspectors, is a source of current information concerning approved procedures and is also a check on his work to verify that he has not forgotten or missed something in his work. This man can go home, or to the barracks, when his work is done and rest easy. He knows that his efforts have been reviewed and approved as conforming to current standards and that the aircraft is as safe as he can possibly make it.

What can you do, as an individual, along the lines of Quality Control? What can you do to improve the availability and safety of squadron aircraft? The inspectors do review your work and they do certify that you have completed the job properly, but each has only one brain and two eyes. Each man on the job probably, though possibly not experienced as an inspector, is similarly endowed physically. This is where two heads are better than one and pays off. If you as an individual mechanic/technician, have seen something you don't think is proper or safe, tell the inspector; he is interested. If you have an idea about how a job could be done in less time or more safely, the inspector is interested in that too. You may possibly think of ways of improving the quality or safety of the aircraft, or of shop equipment or ground support equipment—while engaged in a bull session in the chow hall or barracks. Rather than let it slip your mind—write it down. Conditions may be not such that you could describe your idea in detail at the time, but make a brief note to yourself anyway—then later write it up in detail or describe it to your division inspector, division chief or even to your division officer. If the idea is a good one the division inspector will bring it to the attention of the senior inspector of the Quality Control Division, to the Quality Control Division CPO or to the Quality Control Division Officer. They are all interested in new ideas concerning ways of improving the overall quality and availability of squadron aircraft and, at the same time, decrease the hazards involved to both men and equipment. In short, Quality Control is an *ALL HANDS* (all squadron) project consisting of:

► Improving the material condition of squadron aircraft.

► Increased availability and safety of aircraft and equipment.

► Methods of simplifying and speeding up the tasks required, without impairing safety or availability.

► Creating, through recommendations, procedures that can be submitted to the Bureau of Naval Weapons and published for guidance of other activities operating naval aircraft.

Inspectors should be senior and experienced . . . .

CNATra: Quality Control—

Inspectors Report to Quality Control Officer, Provide Records for Analysis, Trends and Follow-up

QUALITY control essentially refers to the quality and completeness of work performed within the Aircraft Maintenance Department. It includes inspection of work performed, compliance with applicable directives, review and analysis of aircraft discrepancy history, and conducting test flights: all these ensure that aircraft are in all respects safe for flight, with all equipment functioning so as to complete the mission the aircraft is designed for.

Quality Control Officer

One officer will be designated as Quality Control Officer with responsibility for establishing and supervising inspection procedures and standards within the Department. He shall ensure that all work performed by Department personnel is in accordance with applicable directives and that the quality of work meets the high standards demanded in the aeronautical field. He shall maintain an up-to-date list of qualified quality control personnel who are authorized by the Maintenance Officer to perform inspections and tests and the Quality Control Officer shall compile written examinations for all type inspectors with the assistance of the various division officers. In addition, he shall establish a procedure for analyzing discrepancy trends, keeping written records of these trends, and provide follow-up action to stimulate improvement of quality of work being performed.

Master Inspectors

Master Inspectors are personnel qualified to inspect all work performed and to perform functional

checks, including test flights for multi-engine aircraft, on all items for the model aircraft and/or its related components in which they are designated by the Aircraft Maintenance Officer. Inspectors will sign their *complete signature* on all work inspected. The Inspectors will act as full-time quality control representatives of the Aircraft Maintenance Officer to maintain the highest degree of quality and safety of products produced.

Functions of Quality Control Division

a. Establish inspection procedures and standards to ensure that maintenance and repair work on aircraft, engines, accessories and equipage has been performed in accordance with current Navy standards and safety of flight requirements.

b. They shall ensure the inspection of aircraft coming under the cognizance of the Aircraft Maintenance Department for shop, hangar, or line maintenance, to determine that they are, upon completion of such work; ready for flights in all respects. This inspection includes not only the inspection of actual work performed, but also the checking for operational ability of elements of the aircraft which have been disconnected or torn down in order to perform such work. This includes progressive inspection of all aircraft and aircraft engine checks.

c. Ensure the inspection of RFI material and spares for acceptable quality and necessary modifications.

d. Maintain a current list of all personnel authorized by the Aircraft Maintenance Officer to perform inspection duties and ascertain that they understand completely the inspection procedures prescribed by the Quality Control Division.

e. Provide for inspection coverage at all times, including aircraft deployment regardless of what phase of maintenance is being performed.

f. Interpret applicable directives, maintaining close liaison with planning and prepare proposed maintenance instructions to implement such directives.

g. Provide supplementary format for such inspection control as may be necessary, including annual revisions of check sheets, etc., prescribed by higher authority.

h. Supervise a weekly pilots' aircraft inspection program on assigned aircraft, keeping a written record of discrepancies found and corrected.

i. Maintain adequate technical information to support inspection operations.

j. Determine that maintenance test flights on aircraft have been performed as required and that test flight cards are kept current and up-to-date and filled out *completely* as required.

k. Determine that sufficient ground checks and pre-flight inspections have been performed on aircraft processed by the Department for operational quality and safety of flight requirements.

l. Review weekly discrepancies found by pilots during flight for the purpose of improving quality of inspection procedures and ascertain that *no* recurring discrepancies are being allowed.

m. Obtain information from other air stations and O&Rs to determine ways and means of continuously improving quality of workmanship in the Aircraft Maintenance Department.

n. Ensure adequate training of personnel in quality control procedures in order to maintain the high standards required for a Quality Control Inspector.

o. Analyze discrepancy and quality trends on aircraft assigned to the department for maintenance and provide follow-up action and professional guidance to stimulate and improve the Quality Control Division.

p. Inspectors will inspect and sign off, using the full signature, the following:

(1) All intermediate and major inspections.

(2) All acceptance and transfer checks.

(3) Engine changes and cylinder changes.

(4) Propeller changes.

(5) Incorporation of aircraft service changes, electronics material changes, armament material changes; and, engine bulletins, aircraft bulletins, and accessory bulletins.

(6) Any major work required by higher authority such as engine overspeed/overboost, hard landings, etc.

(7) All landing gear functional checks and/or replacement of any landing gear system components, any replacement of hydraulic line, fuel lines, etc., ascertaining that a functional check is conducted and tested at least five times.

(8) Any other work designated by the Quality Control Officer.

Collateral Duty Inspectors

Assignment of collateral duty inspectors will be kept at an absolute minimum. The qualifications of these Inspectors shall be the same as those for the full-time duty Master Inspectors and the functions shall be the same. The only difference between the two designations shall be that the collateral duty inspector shall be assigned a primary working station within the Aircraft Maintenance Department other than in the Quality Control Division. *NOTE:* No person may act or sign as the inspector for work that he has performed himself.

Designation as Inspector

The Aircraft Maintenance Officer will designate Inspectors in writing.

VT-3:

Quality Control—

Program has Nucleus of Highly Qualified Technicians 'Accountability Sharpens Individual Responsibility'

It is now possible, after nine full months of operations, to evaluate the "quality control experiment" at VT-3. Quality control theory has been given a fair test in a military setting. What have been the results of the test?

FLIGHT instructors and the officers and men of the Maintenance Department rate quality control a success. The instructors are impressed with the improved condition of the planes. Few flights are lost owing to aircraft discrepancies. The men of the Maintenance Department like the program, because they know it has helped them raise the quality of their work.

For the squadron, quality control has provided an entirely unexpected bonus in manpower utilization. It had been assumed that an inevitable part of the price of higher quality would be reduced maintenance output, since five of the most highly qualified technicians were transferred from active maintenance to "overhead" jobs. That assumption was found to be invalid.

With controlled quality, the total amount of maintenance work required declined. "Down gripes" between checks declined. The amount of work rejected after final inspection or the test flight declined. It was found that it requires less manhours to do a job right once than to do it "quick and dirty" once and then do several jobs to correct deficiencies.

Even the saltiest veterans in the maintenance field have a good word for quality control. Lt. Bill Christi, the Shops Division officer of VT-3, is a mustang who has spent most of his 20 Navy years in aircraft maintenance. The importance he attaches to quality control is reflected in his remark, "If we get down to where we have only one first class left in the squadron, I would be in favor of assigning him to quality control."

The real "proof" of quality control is the squad-

ron safety record of 48,538 hours without a major accident. Why did quality control succeed? It can be argued that it succeeded because of the wholehearted support of everyone in the squadron. But it can just as well be argued that it has enjoyed support because it has been a success.

The answer to why it has worked and won support seems to lie in a soundly organized program staffed with the right number of qualified people. The squadron has managed to find the happy medium between the undesirable alternatives on the one hand, of staffing the division with collateral duty people, and on the other of overstaffing it so that it becomes a blood-sucking empire draining too many of the most highly qualified technicians from the producing divisions. VT-3 feels that if it is ever to "get off the ground," *the quality control program must have a nucleus of highly qualified technical people.*

Violation of the well known management principle that "*no one individual should at the same time be required to be critic of, and subordinate to, another individual*"—the effect of the collateral duty approach—inevitably reduces quality control to "just another program."

Arrangement of VT-3's five men in Quality Control permits them a minimum of one AD and one AM on duty at all times for their "around the clock" maintenance effort. This small number would never be enough if quality control attempted a 100 percent inspection of all maintenance work accomplished, but it is adequate to perform the most vital inspections and to act as a trend spotter and catalyst.

Perhaps the key to the success of the VT-3 quality control effort is to be found in the men selected to man the Quality Control Division. The history of quality control at VT-3 dates from 10 October 1959, the date the Whiting South Field Maintenance officer let the Quality Control officer select from the entire Maintenance Department the five men he needed to staff the Quality Control Division. The men selected were highly respected both as petty officers and technicians. The respect these individuals enjoyed has carried over to the new Quality Control organization and ultimately, to the idea of quality control itself.

Another reason for the success of quality control at VT-3 is that it is soundly based on personal responsibility. The introduction of quality control has in no way relieved the maintenance people of any responsibility for quality work, but has rather sharpened that responsibility by adding accountability. Poor workmanship reflects on the man who turns it out. Good workmanship—more the rule now—also reflects on the man. From personal responsibility has come increased pride. The crew of VT-3 takes justifiable pride in their achievement.

"Accountability sharpens individual responsibility."

AEWBarRonPac: Quality Control—

People Neither Perform the Work Nor Report To Those Responsible for Work Accomplishment

MAINTENANCE quality control is a specific function of the Maintenance Department as prescribed in BuWeps Inst. 5440.2. The familiar "Quality Control Inspection" does not comprise the total, or even the largest share, of the quality control function. It is a well known fact that Quality cannot be inspected into a job. Statistical analysis indicates that even 100 percent inspection in all operations will allow as much as 3 percent defective material to pass.

This revelation leads to the realization that *the man who does the job controls quality.* The degree of quality attainable depends upon the training received by the man doing the job, the tools available to him, and the supervision afforded him.

Inspectors verify that a job is properly done and that existing procedures are such that similar jobs will normally be done properly. Inspectors must therefore be highly qualified in general procedural knowledge and technical knowledge, as well as being thoroughly familiar with desirable work habits, workmanship and good working conditions.

Quality Control in AEWBarRonPac is administered by a Staff Division under the Maintenance Officer. It establishes inspection procedures and standards in compliance with current Navy inspection requirements and serves as full time quality control representatives of the Maintenance Officer to maintain a high level of quality and safety of work produced. It provides designated inspectors in all work groups and insures the inspection of aircraft coming under the cognizance of the Maintenance Division for Hangar or Line Maintenance to determine that they are, upon completion, in all respects ready for flight. Finally, it analyzes discrepancy and quality trends on aircraft assigned to each division for maintenance, and provides the follow-up action and functional guidance to simulate improved quality on a Departmental basis.

Evaluation of a quality control system can be accomplished only by an external group who neither perform the work nor report to the individual responsible for the work accomplishment. This function is performed here by flight crews during the highly detailed preflight inspection, which is the foundation of this squadron's quality control system and its enviable safety record. Without accurately presented preflight and inflight discrepancy reports safety and availability cannot be assured.

Let's Talk Quality

Rear Admiral P. D. Stroop, addressing members of the American Society of Quality Control, said in part, "At no time in history has it been as important for us as a nation to be more concerned with the quality and reliability of our weapons systems."

The concept of modern weapons today dictates that aircraft, as part of the weapons system, must be as reliable in all its flights as a one shot missile is in its flight. A mission of detection for instance, cancelled because of a malfunction, could be as disastrous as a bomb dropped on our home.

Reliability means honest workmanship, adherence to detail, proper use of tools and above all, constant surveillance by supervision for possible areas of improvement. Too many of us are content to let things ride as they are, so to speak, as long as there are no pressing problems. Speaking to supervisors however, this is not enough. The responsibility of supervision does not end when the product is completed. Maintaining schedules is an important function of supervision, but of greater importance is maintaining quality. Quality assures some measure of reliability, but lack of quality insures unreliability. Training of personnel in good shop practice, reporting poor conditions or improperly fitting parts to investigating agencies, checking transfer of materials to preclude damage, all these are the signs of a good supervisor. A little-known area and one whose importance cannot be over stressed, is in tooling. A good supervisor must be certain that tools within his jurisdiction are being used properly and further, that parts coming from such tools are as designed. In most cases, tools which are improperly used can cause errors which will not be discovered until long after the part has been made, installed and covered up by adjacent assemblies. This can result in a costly rework program, or it can ground aircraft, or worse, cause accidents.

* * *

A washing machine manufacturer was forced to recall 40,000 machines for costly rework. A tool for assembly of certain mechanisms allowed improper mating with the result that excessive wear caused bad leaks and leaks burned out electric motors. Had the parts been properly checked with their mating components, the supervisor responsible would not have been in the predicament he soon found himself in.

Constant surveillance is quality assurance.

—Grumman Plane News, Aug 12 '60

"The *quality* of maintenance work must never be sacrificed for *quantity*."

—*ComNavAirPac*

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TRUE

"I was working in the fuel pits when an F8U had a blowout on landing. I took the tow mule and went to the line shack to pick up the jack and main tires. Upon leaving the line shack I stopped at a nearby aircraft and took the downlocks. I took the downlocks from this plane on the line because it was the nearest plane to reach and I had to have downlocks for the plane on the runway.

After taking the downlocks I went out to the aircraft on the runway and assisted in towing the aircraft off the runway, changing the tires and towing it back to the area. I saw upon returning that the aircraft I had taken the downlocks off had collapsed. I parked the tow mule and aircraft in the fuel pits and reported to the master sergeant."
—K-POW!

Four-Leaf Klover Klub

The difference between an incident and an accident is often a matter of luck.

Engine Indigestion

FJ-3 VFR Takeoff Phase—

After becoming airborne a bird flew across flight path from starboard to port and was ingested into the engine. A loud "clunk" followed by a steady and loud whine were the only indications of trouble; engine instruments were normal and there was no noticeable vibration or roughness.

Pilot called tower, dumped external fuel and made a planned precautionary flameout approach to an uneventful landing. He described his engine sound as follows: "The very loud whine was like a giant vacuum cleaner."

Fuel, Fumes, and Fire

AD-5 Pilot: 1500 total hours, 280 in model—

After 20 minutes of flight on a VFR cross-country, fuel fumes were detected and the passenger in the aft compartment found fuel around the heater exhaust port. The seepage appeared to stop and then continued stronger than ever. After checking his boost pump, primer, and circuit breakers, the pilot elected to continue to his destination, one hour and ten minutes distant.

At destination the canopy was opened in the traffic pattern and the passenger noticed smoke in the aft section. The aircraft touched down and flames appeared rapidly in the area of the middle cabin heater. Informing the tower of the emergency and alerting the passengers to abandon the aircraft, the pilot turned off the runway at the first intersection and secured the aircraft. All personnel abandoned safely while crash crews extinguished the fire.

The heater was not operating though switch was ON (passenger mistakenly thought it had been turned OFF). Exact source of fire not determined.

Comment by Command: In this potentially dangerous condition the pilot displayed a lack of sound aeronautical judgment and violated basic safety principles by not returning to his home field as he was only minutes away when the fuel leak was revealed.

Out of Bounds

P2V-5 PPC: 5000 total hours, 3000 in model—

On a crew training flight a radar homing run had just been completed when another aircraft, later identified to be a JD configured with utility paint scheme, was sighted approaching from one o'clock high. P2V was in a fleet gunnery area.

Patrol plane pilot descended in order to pass well under the JD. Simultaneously the JD started to a right turn and passed in front of the P2V with an apparent safe altitude separation. At precisely this instant, indications of an inflight collision was felt. A quick exterior and interior check of the aircraft failed to reveal any discrepancies but a target banner was seen floating down about where the incident occurred.

The P2V pilot was unable to contact the JD and the P2V returned to base. Postflight inspection showed the starboard prop had cut through the tow cable. Prop required replacement and small patch was needed on lower cowling of engine.

NOTAM file had not been reviewed by P2V pilots prior to flight.

Tug of War

HUP-2 Pilot: 2230 total hours, 770 hours in model—

Takeoff was attempted from flight deck. As helo started to lift, starboard chockman released his tiedown; port tiedown held fast until wheels left the deck. Tension pulled helo to port. The nose dipped and contacted the deck at which time the port tiedown ring parted and the helo righted itself.

Why: Attempted takeoff was without clearance signal from flagman. Tiedowns were in place.

Comment: Liftoff was for purpose of respotting in order to shut down. Pilot was preoccupied with problem of respotting and forgot tiedowns had been attached.

Odds 'N Ends

F8U-1 Runway 32R Moffett

Ceiling 3500 feet, visibility 12 miles. Following tacan penetration pilot broke lot into visual conditions and carried a practice GCA down to GCA minimums. The surface wind was reported ESE at 9 knots which produced 5-knot tailwind component. Runway was wet from recent rain. Internal fuel load was 4000 pounds.

Aircraft touched down at 135 to 140 knots, 500 feet from threshold of 32R which is 9200 feet long. When the last 1000 feet of runway was approached, aircraft commenced a turn off to the right but began skidding sideways finally reversing direction 170 degrees from landing course. Port wheel dropped off runway into mud and port wing tip struck field boundary fence.

On a typical day at Moffett, F8U landing in 10-knot headwind component will utilize 7000 feet of runway to stop. Utilizing same stopping technique under above conditions would increase landing distance 25 percent. Normal aerodynamic and wheel braking was used (aerodynamic until 80 knots then light brake pressure at first, increasing pressure as aircraft slows and braking becomes more effective). This proved to be inadequate and pilot believed earlier intensified braking action would have shown deficiency in time to lower the tail hook for the overrun arresting gear.

Good Show

F8U-1 Flight test of fuel transfer system—

During flight, failure of utility hydraulic system was experienced. Pilot attempted to lower landing gear pneumatically but nose gear indicated unsafe. Nose gear was trailing about 20 degrees aft of full down position. After attempts to force nose gear into locked position by pulling G, pilot set up for normal landing.

As main gear touched down, engine was shut down. Nose was held off for about 3500 feet, then pilot eased nose onto runway using only enough braking action to keep aircraft rolling straight ahead. Aircraft rolled about 1500 feet after nose contacted runway. Repair required replacement of nose gear doors, skin on under side of nose scoop and gear actuating cylinder.

Nose gear actuating cylinder was cracked permitting rapid loss of utility hydraulic fluid. Crack prevented complete pneumatic extension of nose gear.

Wing Down Landing

F8U CAVU Pilot: 400 total hours, 60 in model—

Utility hydraulic system failed in flight. Pilot was unable to raise wing by normal method or by emergency air bottle. Aircraft was landed with landing droop down at 165 knots. Engaged field emergency arresting gear at 150 knots.

When changing the F8U wing incidence the release switch on the wing incidence handle must be depressed before the handle is moved and kept depressed throughout the entire travel of the wing incidence handle. This prevents solenoid gate lock from returning to lock position and possibly binding the selector valve lever as occurred in this case.

As long as pressure is exerted against selector valve lever a lock which is binding will not release. Remedy is to turn OFF generator thus opening gate lock and permitting wing to raise. Once wing is raised, electrical power may then be returned to normal.

Low Blow

AD-6 Authorized Sandblower in CAVU weather—

The approved low-level route covered terrain ranging from flat to fairly hilly. Authorized altitude was 200 feet. The aircraft returned to home base with approximately 10 feet of copper wire trailing from each pylon. Neither the pilot nor his escort had any knowledge of hitting a wire until postflight inspection.

Moderate to heavy turbulence had been encountered and a sudden loss of 50 to 100 feet is not unusual when encountering a strong downdraft even at 200 feet clearance.

Recommendation: In turbulent weather allow a greater safety margin for obstacle clearance.

Up—Up—Up

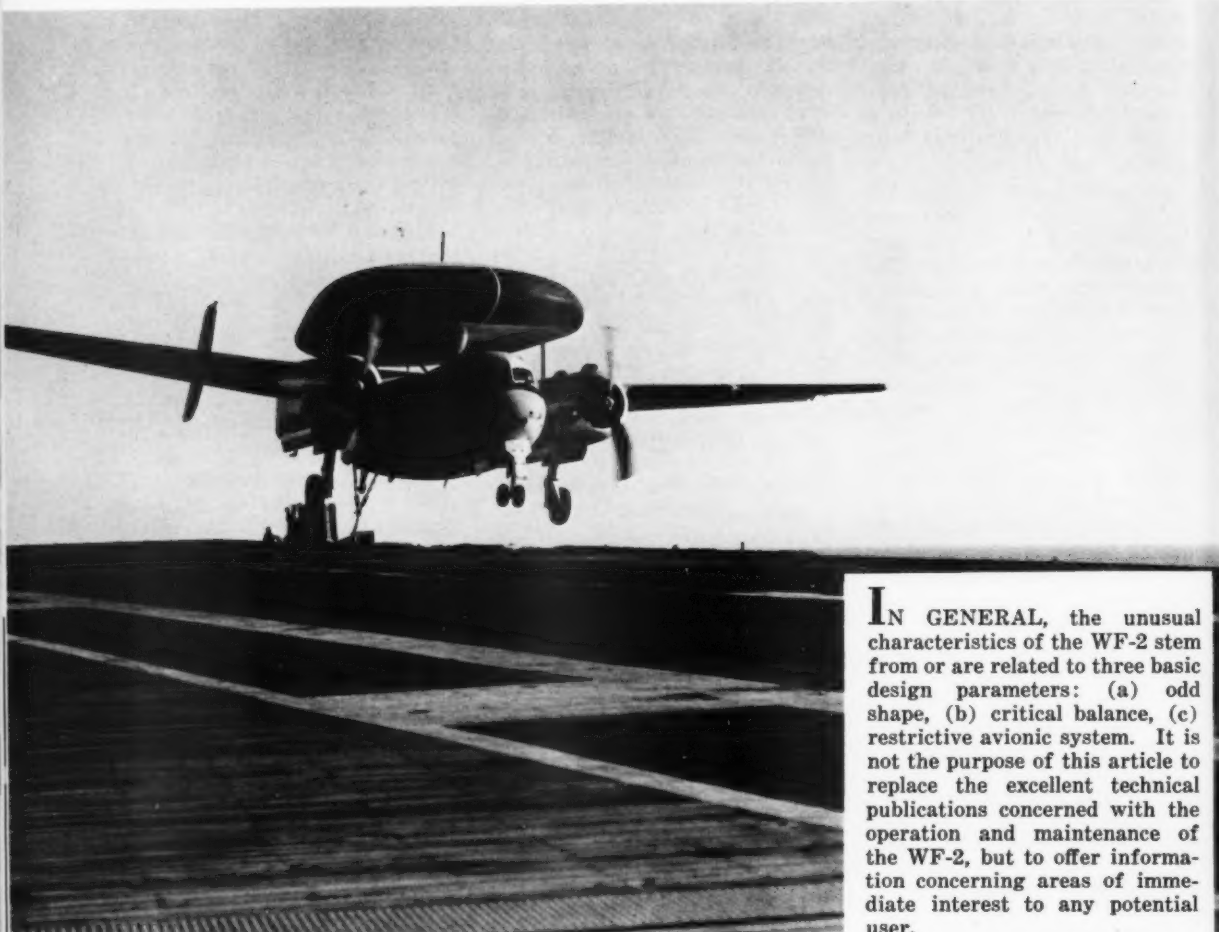
A4D-2 Pilot: 2300 total hours, 180 in model—

At approximately 1100 the aircraft was cleared to the landing pattern for a circling approach. The pilot made a normal break, called gear check to the tower at the 90-degree position, and subsequently made an unintentional wheels-up landing.

Two antennas, the air refueling probe and two 300-gallon drop tanks were damaged beyond repair as a result of sliding on runway.

As the A4D had approached the 180 position an Air Force aircraft entered the landing area and was cleared to break upwind. However the AF plane broke early and turned into the landing aircraft. This caused a distraction in the A4D cockpit at the normal gear check point. No wheels watch was on station as the duty runway had just been changed.

The Wonderful World



The WF-2 aircraft is new to the fleet. Experience has shown that personnel involved in the handling, servicing and operation of the WF-2 tend to treat this aircraft as they would an S2F or TF. This has caused some difficulty, particularly aboard carriers. The WF-2 is larger, wider, higher and requires different engines than an S2F or TF. Six months WF-2 operation by VAW-11 has disclosed several unusual characteristics worthy of dissemination to operators of the aircraft. Special precaution is required in these areas to prevent damage.

IN GENERAL, the unusual characteristics of the WF-2 stem from or are related to three basic design parameters: (a) odd shape, (b) critical balance, (c) restrictive avionic system. It is not the purpose of this article to replace the excellent technical publications concerned with the operation and maintenance of the WF-2, but to offer information concerning areas of immediate interest to any potential user.

In normal attitude, the overall height of the WF-2 is 16 feet, 10 inches. Because of the resulting minimum clearance in the hangar deck and the difficulty of inspecting the top of the radome, it is very important that there be no protrusions extending downward from the overhead.

The WF-2 is critically balanced, sitting on the main gear

of 'WILLY FUDD II'

and nose wheel when the wings are spread, but on the main gear and tail wheel when the wings are folded. These conditions make ground handling and towing difficult. NavAer 01-85-WAA-2-1 provides the necessary detailed instructions for ground handling. Attention is invited to the fact that modified tow bars are required to avoid puncturing the skin of the aircraft when towing by the tail, or by the nose with the wings folded. Steering of the aircraft while towing or pushing is not precise, and extreme care must be taken to avoid deck collisions. Due to the critical balance, the tail wheel must never extend over the deck edge. Care must be exercised to assure proper spotting on the deck edge elevators in order that the aircraft clears all obstructions while maintaining all four wheels on the deck.

The wings on the WF-2 fold backwards, much like the TBM and F6F. Unless jury struts are installed, the wings will droop after folding. Therefore, it is a requirement that the plane captains install the jury struts before, or immediately after, engine shutdown. The wings of the WF-2 will not fold unless the flaps are fully UP. Therefore, after landing, the flaps must be given time to retract completely before the wings may be folded. With the wings folded, the WF-2 presents a box-like plan, resulting in vulnerability of the vertical stabilizer, wing leading edges, wing butts, and propellers to damage during deck handling. Particular care must be exercised while spotting the aircraft in a limited area due to this shape and insufficient steering control.

The WF-2 has a self-contained dummy load for the radar. This makes it possible to perform radar maintenance on the flight or hangar deck with no possibility of dangerous radiations.

Recent carrier operations have revealed two areas where flight deck handling can result in damage to the WF-2. To avoid like damage, the following are recommended:

Extreme care must be utilized in repositioning the aircraft after landing if the arresting cable is employed to pull the aircraft backwards. Failure to observe this will result in tailhook damage, possibly undetected.

When positioning the aircraft on the catapult, the nose wheel should be straight (aligned fore and aft) going over the shuttle. The use of a nose wheel tiller bar is not mandatory, but is good practice.

The aircraft has an automatic feathering feature and recently a WF-2 had a succesful single engine catapult launch. It is recommended that the aircraft be catapult launched whenever a full fuel load and full crew are aboard. The deck run for this weight (27,000 lbs.) is excessively long and usually the aircraft is below safe single engine speed (90 kts) at the moment of lifting from the deck.

The WF-2 requires three-phase, 120-volt, 400 c.p.s. power for most instrumentation and all electronics equipment. A recent experience indicated that it is extremely important that the frequency be held within 380-420 c.p.s. as an out-of-tolerance frequency condition can result in burning of the two transformer-rectifier units. These units are costly and in very short supply. Due to this requirement, and the servicing requirements of the WF-2, it is necessary that all carrier deck edge power outlets be operative and that these and all WF-2 mobile power units be checked for proper frequency tolerance.

Unlike conventional reciprocating engine aircraft, the determining factor as to when the WF-2 is ready for operational launch, is not the engine warm-up, but when the AN/ASN-28 (PRARS) has reached its alignment. This generally requires approximately 15 minutes after power is applied to the equipment. It is recommended that the WF-2 be spotted near an operating, frequency controlled deck edge power outlet so that the equipment may be aligning prior to engine start or allow ample time after starting engines before launching aircraft. The PRARS may be aligned in flight with reduced accuracy, but this is not recommended because the aircraft can not perform its mission if PRARS does not check out.

As with most new aircraft, the WF-2 requires frequent careful inspection to reveal occurrence of the unexpected. To emphasize this need, it is noted that structural cracks have been discovered in the firewall, radome, and other isolated areas.

It is strongly recommended that all personnel who will be involved with the ground handling, flight, or maintenance of the WF-2 aircraft review the following publications:

NavAer 01-85WAA-2-1 Handbook Maintenance Instructions, Section I, General Information.

NavAer 01-85WAA-1 Flight Handbook, Navy Model WF-2 Aircraft, with revisions and Confidential Supplement.—*Contributed by C.O., VAW-11*

The Parable of Joe
by Wing Commander L. A. Yellowlees, RCAF

Let us consider the groundcrew,
Too often forgotten by all.
They get to do time in the heart of the line
But never to carry the ball!

Joe is a chap who is needed,
A problem that won't go away.
But remember of course that the knight on his horse
Would tell you the same in his day!

He'd say he was lacking in armour,
And his new iron pants weren't right.
And did he show pity to the overworked smithy?
You can't expect that from a knight!

"I must have a bigger brick privy,
Ye drawbridge is terribly short.
And get me a steed with a little more speed,
My charges must never abort!"

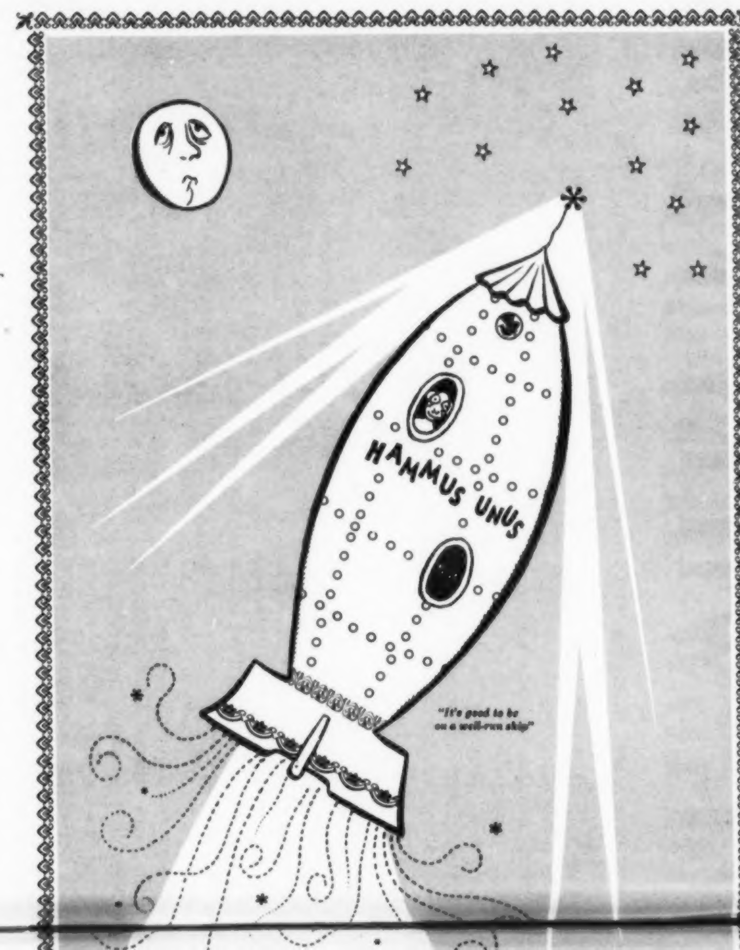
"Don't tell me thee can't find ye money,
Those problems don't move me at all.
Why I've got a notion to block thy promotion,
Get snappin' and get on ye ball!"

So the vassals and serfs got to sweating
And bending their backs a bit more,
'Cause it wasn't the rage in the chivalrous age
To ask a lord why, or what for.

But suddenly—horror of horrors!
The knight was knocked from his mount!
Pierced to the marrow by a little ol' arrow,
And down went m'lord for the count.

There lay the lord and the master
Flat on his back on the field,
And he yelled and he howled that he must have been fouled,
And swore he'd remount ere he'd yield.

Well, sure enough, centuries later,
A couple of vassals named Wright
[illegible] to a couple of wings,
And handed it all to the knight!



And he yelled and he howled that he must have been fouled,
And swore he'd remount ere he'd yield.

Well, sure enough, centuries later,
[illegible]
And handed it all to the knight!

Up into the cockpit he vaulted
And tried on the saddle for size.
With throttle full bore and a rush and a roar,
He tore a few holes in the skies.

But the Joes were back where they started,
And they put down their tools with a sigh,
Cause they knew sure as fate when he landed the crate
They'd have to perform the DI!

"Build me another big hangar,
I need one more mile to take off.
This aircraft won't do, I must have mach two!
Attend to it will you, old toff?"

So the chargers grew bigger and faster.
They belched out their fire and their smoke.
To the knight it was pleasant—but not to the peasant,
Joe never could savour the joke.

Then up and spake an old boffin,
He of the rapid slide rule.
"I have in my pocket the plans for a rocket,
I'm telling you, dad, it's real cool!"

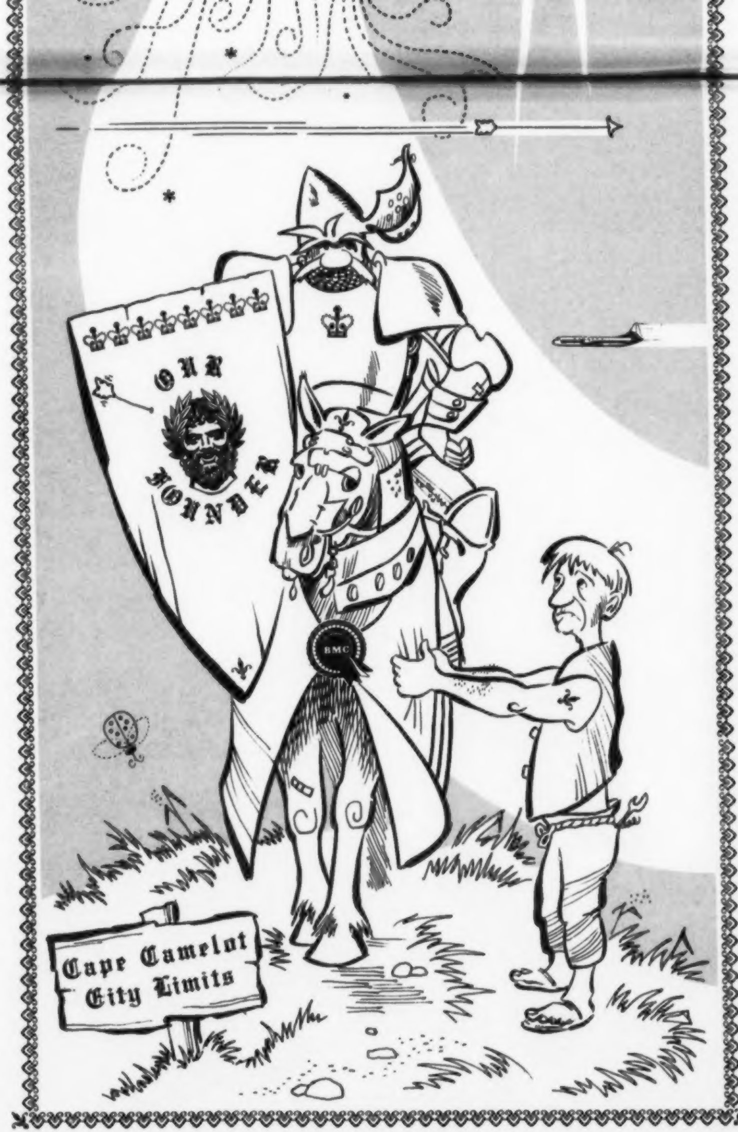
"Almost as big as a mountain,
Cockpits and saddles galore.
Now surely by rights we should fill it with knights,
And we shall be bothered no more!"

Now after all was assembled,
And the brass gathered round for a look,
You could tell by their sighs and the gleam in their eyes
They were ready to swallow the hook.

Into the rocket they clambered,
Each in his own private place,
And eager as beavers they played with the levers
Till the monster roared off into space!

Thus the Joes the old world did inherit,
Mountain and river and plain.
And the knights in the sky went hurtling by
As they circled the sun once again.

—Courtesy RCAF 'Roundel'



notes from your FLIGHT SURGEON

No Time for Indecision

BOTH the pilot and dual pilot of a disabled F9F-8T ejected through the canopy and sustained only minor injury. Here are some comments written by the pilot in control of the aircraft at the time of ejection:

"I feel that all jet aircraft emergencies at low altitudes are dire emergencies and that pilots should make every effort to eject as high as possible. The shock, injuries and disorientation involved in the ejection leave the pilot in a precarious position for survival in the sea. The higher the ejection, the more time the pilot has to recover from the initial shock and free himself in the water and survive. Had I ejected much lower, my injuries would have made surviving initially much more difficult (and wind and weather conditions were almost ideal in my case).

"The zero altitude ejection feature of the Martin-Baker seat could possibly influence a pilot to ride the aircraft to a very low altitude while attempting a start, feeling that he can eject successfully very low as well as he could higher. This, in my opinion, is a dangerous situation and could well result in a pilot either being drowned while getting out of his chute, or worse, that he might change his mind and not eject, but try to ditch the aircraft in the sea.

"Every pilot should make a rule-of-thumb for himself in regard to ejection. First, he should make up his mind never to 'ride (a jet) aircraft in' and, second, he should set a definite altitude as his minimal ejection height (mine is 6000 feet) and stick to it no matter what else influences him. In this accident our emergency occurred at less than one-half my minimal ejection altitude and I feel certain that my preconceived plan (indicating immediate ejection) saved my life, and very possibly that of the other pilot. The time you have is measured in seconds and there is no time for indecision. I would estimate not more than 45 seconds elapsed from the time of flameout until I was dropped into the water."

Chinstraps

REPORTING on a TV-2 accident, a flight surgeon notes that the pilot's chinstrap had not been replaced on his APH-5 helmet after installation of the Hardman suspension system. This condition existed throughout the squadron. (This isn't the only one—see APPROACH March 1960. — Ed.) Reemphasis of BACSEB 17-58A recommending installation of the chinstrap is in order.

Unfitted and Unsuited

DURING a night navigational flight the pilot thought he had blacked out momentarily during a turn. He then thought he had a generator failure and extended the emergency generator. He returned to the field and engaged the arresting gear at a speed of 100 knots. The pilot had missed two meals on the day of the flight. His oxygen mask did not fit properly. His anti-G suit was worn too loosely to be of any benefit. The committee recommends that all MAG-12 squadrons have periodic inspections of pilots in full flight gear by the squadron COs or aviation safety officers.—*MAG 12 Aviation Safety Sub-Council 8 Jan 60*

Oral Inflation Valve

ARE you sure you know the proper way to lock the oral inflation valve on your life vest?

A pilot in a water survival situation had only his life vest for flotation. Before he was rescued by a destroyer he had to inflate his life vest orally twice. Later it was determined that his vest deflated when the end of the oral inflation tube was intermittently depressed by the opposite side of his vest as he was tossed about in the ocean.

The life vest oral inflation valve should be locked — SCREWED OUT—to prevent air from escaping after the vest has been orally inflated.

If You Have a "Used" Parachute

THE question often arises as to the disposition of a parachute that has been used in an ejection or bailout. The following is taken from BuWeps Inst NavAer 13480.1:

"Parachutes and actuators which have been reclaimed following emergency bailout or ejection should be removed from stock and turned in to the nearest supply activity on an exchange basis. The turned in parachute shall be shipped to the Officer-in-Charge, Naval Parachute Unit, Naval Auxiliary Air Station, El Centro, California—marked 'For Naval Parachute Unit Evaluation and Testing...' "

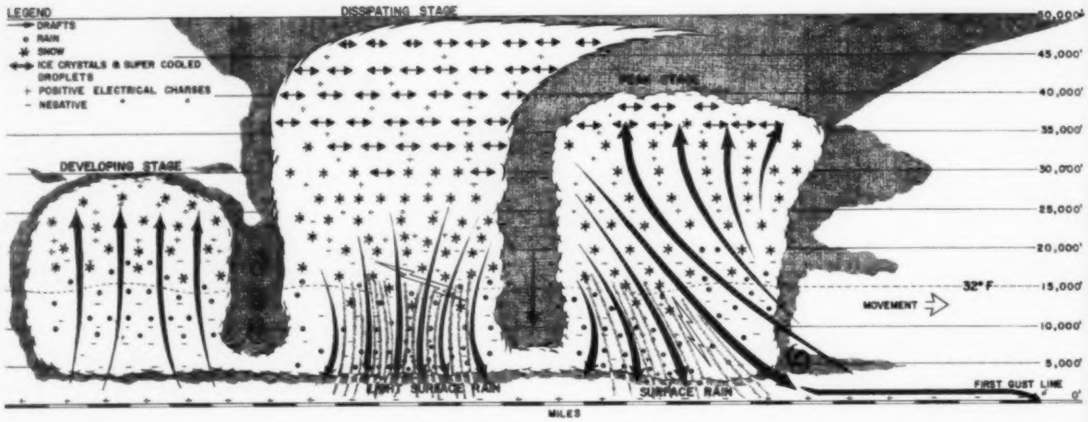
THUNDERSTORM FLYING

by CDR E. Merle Russell

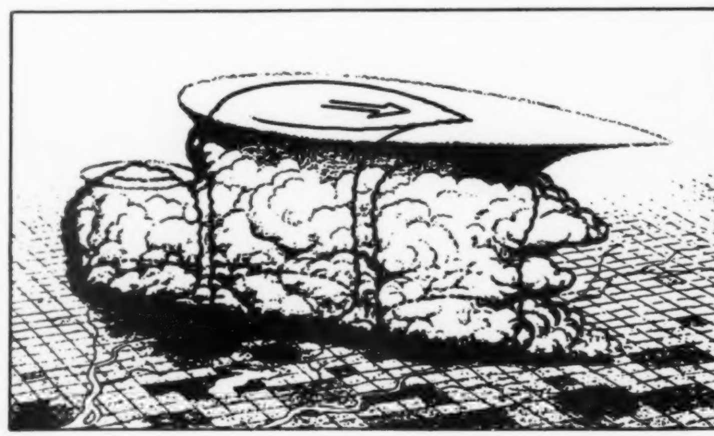
THUNDERSTORMS have always presented one of the greatest hazards to aviation and therefore one of the greatest operational problems.

Regardless of the engineering excellence of the aircraft and the highest qualifications of flight personnel, thunderstorms demand the respect of those who fly near, in or around them. All Navy pilots have been indoctrinated in ground schools on the dynamics of thunderstorms; most of the older pilots have at one time or another experienced their fury and do not attack them without deliberation. Pilots cannot always avoid them and yet perform all of their operational missions as Naval Aviators. However, all pilots must know and understand thunderstorms in order to do their job wisely and successfully.

The thunderstorm cloud (cumulonimbus) has an innocent, fluffy look but it can be loaded with



The thunderstorm cloud has an innocent, fluffy look — but it can be loaded with all manner of flying troubles.



all manner of flying troubles. It is almost impossible to judge the violence of a thunderstorm until you are in it—and then it is too late. And you can't believe the report of a pilot who has just come through the storm because these storms are constantly and rapidly changing. A storm that offered little or no resistance to a plane flying through at one moment can change within a matter of minutes and release all of nature's fury at one time. Unless the airplane is built and equipped to withstand the most vigorous punishment, and unless the pilot is thoroughly informed of the dynamics of thunderstorms and is a competent instrument pilot, there is but one rule to follow, viz., stay out of thunderstorms. Navy pilots have duties to perform which, on occasion, require them to go through regardless of weather. Therefore, it is necessary that they know and understand thunderstorms.

There are several types of thunderstorms, such as air mass, frontal, and orographic, so designated by the place and method of development. Each of these should be discussed in connection with its relationship to the physical properties and the action of the atmosphere. That is impossible here so only the structure of a well developed thunderstorm and its effect upon aircraft operation will be discussed.

From a distance, the thunderstorm may look like a tall cumulus cloud. Thunderstorms may be buried in a mass of surrounding clouds and, therefore, no definite size or shape can be used as all inclusive identification. However, when it is possible to see a thunderstorm independent of other clouds,

it has certain distinguishing visual characteristics. The cumulus cloud builds itself upward looking like a cauliflower with rolled puffy looking sides. Extended to great heights it is referred to as "towering cumulus." As the storm grows and ages, the top frequently spreads out into a flat top known as "the anvil" or "anvil top." From below, the anvil looks like a solid horizontal cloud extending out in front of the storm; the direction of this extension gives an indication of the direction of the storm movement since the upper winds push these high clouds out ahead of the storm. Along the front and at the bottom of a violent thunderstorm, there is a turbulent cloud that extends downward from the main base of the thunderstorm known as the "roll cloud" or "squall cloud." Whenever this cloud appears, the pilot may be sure that there is some rough weather within the storm because this cloud is caused by the agitation between a rapidly rising air current in advance of the storm and a strong downdraft coming out of the storm. Winds below the storm cloud are strong, gusty, and generally blow up and into the storm from the front and down and out of the storm behind the roll cloud and ahead of heavy rain. Oldtime pilots who "flew by the seat of their pants" referred to the ragged windblown edges of the roll cloud as "fingers reaching down after me." If they got into close proximity of the roll cloud they were involuntarily hurled into the thick of the storm. Airplanes still have that trouble. This roll cloud is not always visible because other clouds may surround the entire storm or the concealing clouds may extend out in shelf-like arrangements.

With the flight hazards known to accompany the roll cloud it is obviously unwise to try to fly under a thunderstorm, particularly in hilly or mountainous country. It is also obvious that a landing or takeoff under a roll cloud would be difficult and often hazardous because winds could suddenly and unexpectedly become strong and gusty crosswind or even a tailwind. Such sudden changes in wind direction and speed change flying conditions and flight altitude so rapidly that all too often pilots are unable to maintain control. With a roll cloud bearing down on an airport at the time of intended takeoff it is advisable to remain on the ground until the gusty conditions have subsided. The exception to this would be that with an airplane properly equipped, a pilot experienced for turbulent flying might take off and fly away from the storm, provided the takeoff can be completed before the "squall" crosses the takeoff path. Likewise, it is better to proceed to an airport away from the influence of the gusty storm conditions rather than attempt a landing under the hazardous conditions of the thunderstorm roll cloud.

There has been a large amount of scientific research conducted for the purpose of ascertaining the structure of a thunderstorm and these studies continue. As knowledge increases flight planning in thunderstorm areas becomes more intelligent but the consensus still holds that only the best trained pilots flying equipped airplanes should attempt to penetrate these storms. Now let's look inside the thunderstorm.

It has been established that the thunderstorm is made up of one or more "convective" cells in which the rising air currents have been clocked at speeds greater than 100 mph straight up. These cells are constantly undergoing changes. They may develop and dissipate as units, separate and distinct from other cells adjacent to them. The combined

Roll cloud edges are like fingers reaching down for you.

military-civilian "Thunderstorm Project" conducted under the direction of Dr. H. R. Byers discovered that thunderstorm cells have three stages, viz., (1) the "cumulus" or growing stage with all convective (rising) air currents; (2) the "mature" or "peak" stage in which the currents are both rising and descending with the descending or downdraft currents existing in the lower half of the cell; and (3) the "dissipating" or "anvil" stage in which there are weak downdrafts throughout the entire cell. These three cells are depicted in the perspective drawing of a thunderstorm on page 28.

Thunderstorm cells form horizontal ellipses (oblongs), varying from about one to five miles in diameter depending upon the stage of development, and are known to extend as high as 67,000 feet. Between the cells there may be an area of a mile or so in which a pilot could find comparatively smooth air if he has radar or other equipment with which he could seek out these "soft spots." The cells themselves are areas of great turbulence and along their edges many gusty whirls result from sheer friction between the strong vertical currents and the slower moving surrounding air. As old cells die out, new ones build up and each cell goes through its cycle from development to dissipation independent of all other cells. Pilots may encounter cells at any stage of development or dissipation and it is not uncommon to encounter the majority of cells in a storm at the same general stage in the cycle. Worst flying conditions exist in a particular cell near the end of the development stage and beginning of the peak stage. These changes in stages are responsible for discrepancies in pilot reports of storm intensity.

Gusts and drafts are of great importance to pilots. Drafts are large scale vertical currents of many thousands of feet, sometimes as much as 30,000 feet. Gusts, on the other hand, are small scale air disturbances, having horizontal dimensions from about 30 to 300 feet. The drafts will change the altitude of an airplane rapidly; but it is the sharp edged gusts which deliver straining jolts sufficient to pop rivets out of the airplane (and the loose fillings out of the pilot's teeth). Generally speaking, the least turbulence of a particular cell will be found below 10,000 feet, the heaviest between 14,000 and 20,000, and moderate to heavy at other altitudes. Pilots usually consider turbulence "heavy" if more than six strong gusts are encountered in half a mile of flight.

Under heavy turbulent conditions the pilot must use extreme caution in attempting to maintain a given altitude. A climbing attitude increases the possibility of stalling; and a diving attitude increases wing stress. Use of power settings for prolonged altitude changes may be preferred to elevator control and the airplane allowed to return to level flight without the use of aileron control if possible. This procedure lessens stress and chances of overcontrol.

As mentioned before pilots can avoid areas of greatest turbulence by using radar. The radarscope shows the reflection off the raindrops and the areas of heaviest precipitation is found in the strong downdraft of the mature cell. This enables the pilot to fly around those areas with assurance that he is following the best course. Another method of circumnavigation of thunderstorm turbulence by use of airborne electrical equipment is under investigation. Recent studies reveal a close relationship between the development of thunderstorm cells with accompanying rain and turbulence and atmospheric electricity. With the greatest concentration of the electrical charge in the turbulent area of storm the pilot will be able to fly around that area by following a line of equal electrical potential as indicated by an instrument which will show the increase or decrease of the potential as you get closer or farther away from the charge center. This prospective instrument is sometimes referred to as "the poor man's radar" and the navigational principle is similar to "flying an isobar" with the sensitive altimeter around a low pressure area. This is mentioned here to alert you to the fact that recent studies in the electrical properties associated with thunderstorms are changing some earlier concepts of the dynamics of the storm. Maybe at some future date these investigations will bring about modification of the elements but as of the moment the hazards remain with us.

And, speaking of thunderstorm electrical charges, let us take a moment to discuss the electrical discharges—lightning. Actually lightning is more disconcerting than dangerous in properly bonded, all metal aircraft since the metallic structure acts as an electrostatic screen (a Faraday cage) in that it shunts discharge currents around the occupants of the plane. A strike usually results only of burning off of radio antennas or other protrusions, and the burning of small holes in the surface skin of wing tips, rudders and elevators. If a plane has been struck it should be inspected and, if necessary, repaired before taking off again.

Sudden blindness caused by the flash is usually the most serious consequence of lightning. This could last long enough to result in more serious situations. For this reason, pilots find it wise to turn up the rheostats on the cockpit lights or put on dark glasses and not look out when flying in thunderstorms. Also, pilots sometimes get deafened temporarily by the sudden loud crash if the earphones are worn too close to the ears.

Believe it or not, an airplane can supply the

The greatest concentration of the electrical charge is in the most turbulent area of the storm.

trigger action to set off a lightning strike and the faster the flight the more likely the lightning discharge and the greater the likelihood of the airplane being struck. The plane will probably not get struck by lightning unless static builds up in the radio or "St. Elmo's Fire" (luminous brush discharge of electricity) appears. But when St. Elmo's Fire appears and static builds up rapidly, a pilot may know that there is a strong chance of his plane being struck by lightning. This will usually occur when the temperature is somewhere between -25°C. and +2° C.

Pilots have often expressed the belief that turbulence is greater when lightning flashes are vertical cloud-to-ground than when they are horizontal cloud-to-cloud. Investigations seem to bear this out within certain limits. Apparently, cloud-to-ground strikes occur more frequently in the building stage of the thunderstorm cell and, as the cell grows older, these diminish and cloud-to-cloud flashes increase. Since the sharpest turbulence seems to be most noticeable near the end of the building stage and the early part of the mature stage, it appears that there is justification in the pilot's observations over a long period of time, that vertical lightning means severe turbulence.

In addition to the worries thus far pointed out in thunderstorm flying the pilot must give consideration to flying through areas of precipitation where the temperatures are at or below freezing. These areas in the tops of thunderstorms can be loaded with supercooled droplets and supercooled droplets can form ice instantly on air frames affecting the aerodynamics of the airplane on air scoops choking off carburetors and causing flame-outs, and in the first two stages in the compressor of jets which can cause rubbing sufficient for severe engine damage.

Icing is a subject worthy of special study and space does not permit its discussion here. However, pilots should realize that the icing hazard is ever-present in thunderstorms and they should not allow themselves to remain in the icing areas long enough for the icing to become a hazard. And they should always be prepared to apply anti-icing equipment and techniques immediately if the flight through the thunderstorm has been started without previous application for power factor or other good reason.

Don't go away. We are not through yet. Don't overlook hail. Hail is to be found around many thunderstorms. These balls of ice develop during

the mature or peak stages of a thunderstorm. There is some disagreement among scientists as to the manner in which hail is formed. Some believe that the hailstone is continually being tossed about in updrafts and downdrafts and each time it is thrown into a freezing area it accumulates another layer of ice. Others contend that it is held in suspension by updrafts long enough for the layers of ice to form by coalescence. It matters little to the pilot how hailstones are formed or whether it is being held in suspension. The drumfire of the pellets against a speeding plane is no solace to a pilot's nerves, particularly when he realizes that large hailstones can cause severe structural damage to his airplane. Pilots of jet aircraft must take particular care to avoid areas of hail not only because of their high speed but also serious damage to their engines can result from the solid mass of hailstones being ingested into them.

In the past, there have been theories exploited to the effect that pilots may recognize hail areas of a thunderstorm by "greenish hues" or other color casts, but there is little or no verification for these theories. Thus far, the only accurate and dependable consideration is that hail may be found in large thunderstorms with violent turbulence and such areas should be avoided anyway. While hail may occur at all altitudes its presence is more prevalent at the higher levels. Also, it is well to realize that hail can occur outside the storm cloud as well as inside. Clear air hail is either that tossed out of the cloud or that that falls from overhanging clouds and is usually within a few miles of the main storm.

The question of "how to fly thunderstorms" has been discussed as long as pilots have been flying airplanes. There are three primary decisions which have to be made before any consideration can be given as to "how" to fly in or around thunderstorms. The first consideration is that of the aircraft. Is it built to withstand the turbulence which can be expected under the worst conditions; does it have a powerplant sufficiently reliable to function in the most severe weather; and is it equipped completely for an instrument flight under the most adverse conditions?

The second consideration is that of the experience and the ability of the pilot to fly instruments in extremely rough air, his ability to formulate his flight procedure before he encounters these violent elements, and his ability to cope with any and all situations which may arise unexpectedly.

The third consideration is that of the storm itself. What are its characteristics? Can it be circumnavigated? What is its size? Is it an isolated storm or is it part of a line of storms (cold front or line squall)? Is it a new and growing storm or an old and dissipating storm? What are the probable stages of development of the cells within the storm? What sort of terrain is under the storm? Which way is the storm moving and what is the shortest distance through it? All of these conditions must be answered before any reliable flight plan can be made.

Assuming that the conditions regarding the adequacy of the airplane and the pilot are satisfactory, the question of how to get on the other side of the storm has yet to be answered here.

Flight under a thunderstorm is not recommended except when there is no other recourse and it should never be done in mountainous country without a thorough knowledge of the country, the local wind currents to be encountered, positive visual assurance that there is no danger of running into more bad weather on the other side of the storm and assurance that he can fly VFR clear through. Also he should fly in areas of least precipitation, thus avoiding the worst turbulence and maintaining the best visibility possible.

If the airplane is equipped for high altitude flight it may be possible to fly "over the top" if it

Commander E. Merle Russell, USNR, served in early World War II as a Ground School Instructor at NAS, Glenview and NAS, Bunker Hill; later as Aerology Officer in BuAer and on the Staff of the Chief of Naval Air Training, Pensacola. He is co-author of "Flying the Weather" and "Climate and Weather for Flight in Naval Operational Zones," as well as many articles and pamphlets. He was one of the first airline meteorologists serving with American Airways, Inc. (now American Airlines), and as such was the originator of the airline dispatching systems. Currently he is a Supervisory Airways Engineer planning international aviation facilities for the Federal Aviation Agency, Washington, D. C., and is a Professional Member of the American Meteorological Society.

Drawing Page 28 by LCDR Teasdale Barney, USNR (ret) who was a staff member of Naval Air Training Command during World War II and is now a commercial artist in New York City.

An ordinary storm can change in minutes and release all of nature's fury at one time.

is impossible to fly around the storm. To do this the pilot should know the conditions on the other side since there may be a group of thunderstorms in the vicinity of his destination. Also, the height of thunderstorms will vary both with seasons and with latitude. Summer thunderstorms in the lower latitudes extend to tremendous heights, 35,000 feet being not at all uncommon and many of them extend possibly over 50,000 feet. Pilots flying in the polar areas do not run into many thunderstorms and if they do these storms seldom extend higher than 12,000 or 15,000 feet.

However, pilots flying in the middle latitudes find it practical to fly between "saddle-backs" over the main deck of clouds and around the towering thunderstorm clouds. This can usually be done at an altitude of about 20,000 feet but a minimum of 5000 feet horizontally and 500 feet vertically should be maintained from the clouds. If there is precipitation falling from an overhanging cloud that area should be avoided because the precipitation might be hail. Also, if flying over the top the pilot of single-engine aircraft should realize the possibility of power failure and the resultant "dead-stick" descent through the storm. This is definitely hazardous.

If there is no alternative but to go through the storm, there are several established procedures that he can follow. Before deciding to go through give one last thought to see if there is a better way, but if the conclusion is to go through the pilot should prepare the airplane for the penetration. Secure everything in the plane. Study the storm characteristics deliberately—do not be in a hurry to dive in. Trim the airplane for straight and level flight at slow cruising speed (speed should be about halfway between cruising and maneuvering). Turn ON pitot tube heater and turn ON the carburetor heater if a reciprocating engine. Check all flight and engine instruments. Check de-icing and oxygen equipment. Fasten safety belt securely. If at night, turn cockpit lights to full brilliance. Tune radio to the station that will be used all the way through the storm (and do not change this setting until you are on the other side of the storm).

Having readied the plane, take another look at the storm and attempt to find the area of least turbulence. The least turbulence, the least lightning strikes, the least hail—in fact the best flight altitude—will probably be in the lower part of the storm if traffic and terrain permit. The worst level is normally in the middle part, i.e., 14,000 to 20,000 feet. The freezing level gives a pretty good indication of where the greatest turbulence might be.

Continued

Having planned his flight through a thunderstorm, the pilot should set his course directly through what he considers to be the shortest distance, and he should not alter that course or change his mind once he has entered the storm. The turbulent area of most frontal type thunderstorms is only 10 to 20 miles through and air mass types are even less. By the time the pilot changed his mind and decided to turn around because of hail, turbulence, icing, lightning, . . . , the chances are that he would have been through the worst and most of it. The easiest, shortest and quickest way is straight ahead on course. To attempt to turn might mean getting lost; and turning under severe gust conditions such as exist in mature cells imposes additional stresses on the wings.

It is more important to maintain level flight than it is to maintain a specific altitude if other traffic and terrain will permit. By maintaining a level attitude, the airplane may gain or lose several thousand feet of altitude as it encounters the updrafts and downdrafts; but, by not using much elevator control, the pilot will keep stresses on his airplane at a minimum.

Summarizing, if a pilot must go through a thunderstorm he should pick an area with the fewest probable weather troubles, set a course which will take him through the shortest distance, and hold that course until he comes out on the other side. He should not change his course nor change his mind. He must keep his head on his shoulders and have confidence in himself and in his airplane.

A Checklist of Meteorological Conditions Favorable for Icing

√ Air Temperature should be between 0°C and —40°C.

√ Expect no appreciable icing at temperatures colder than —20°C except infrequently in cumuliform clouds or in areas of active fronts or strong orographic lift.

√ Expect more ice in altocumulus than in altostratus.

√ A serious icing condition may occur in a drizzle if the cloud temperature is colder than 0°C.

√ Icing in stratiform clouds is usually rime and of greatest intensity between 0°C and —10°C.

√ In stratiform clouds at temperatures colder than —10°C, expect icing intensities to lessen toward colder temperature with no icing colder than —40°C.

√ Non-precipitating layer clouds of temperatures between 0°C and —40°C are more likely to give icing than those in an area of steady precipitation especially those clouds just outside the precipitation area.

√ In an area of steady rain or snow, expect only light icing in the layer where temperatures are 0°C to —10°C (Important exception: freezing rain).

√ Icing in cumuliform clouds is normally greater than that in stratiform clouds at the same temperature.

√ Icing in a cumulus condition is normally quite variable due to the cellular structure.

√Icing in updraft portions of cumulus normally increases upward from the freezing level to an altitude where the temperature is between —10°C and —20°C or —25°C, then decreases above that level.

√ The existence of showers indicates the presence of cumuliform clouds and probable icing conditions in the updraft portions of these clouds.

√ Moderate or heavy icing is often encountered in overcast stratocumulus over and south of the Great Lakes or over the North Atlantic in the north winds on the west side of a low pressure area, especially in early winter.

√ Thunderstorms may contain moderate or severe icing areas in the updrafts. This icing is rarely hazardous since the updrafts are narrow and are flown through rapidly.

√ In clouds over mountainous areas icing is more intense on the windward side and over the crests than to leeward.

√ Avtibe cold fronts and upper fronts associated with occluded systems frequently contain significant icing.

√Freezing rain gives the worst icing of all. Avoid planning a flight through a freezing rain condition. If freezing rain is encountered, reverse course if practicable.

Remember that weather will master the unwary! Read your forecasts! Check the weather sequences! Study the weather map! Plan your flight carefully! Listen to radio weather broadcasts! Don't neglect to debrief for the benefit of following flights! And always be weatherwise!

—TWA—Flite Facts

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POWER VS MOISTURE

THE Directorate of Flight Safety Research received a letter from an Air Base Group in Orlando in which they noted that on two separate occasions pilots had experienced severe loss of power while flying R4Ds in heavy rain. They went on to state that one pilot placed the carburetor air control lever in the filter position and this resulted in regaining power except for the normal drop in manifold pressure that would be expected when using filtered air. They requested comments on the procedure.

The accompanying curves were obtained from Mr. Sydney Berman, D/FSR Technical Director and will give you a good picture of power *vs* humidity and power *vs* ingested rain. As you can see, the old reciprocating coffee mills really lose out with either an increase in humidity or rain. Interestingly enough, turbojet and propjet powered aircraft get a real boost from moisture.

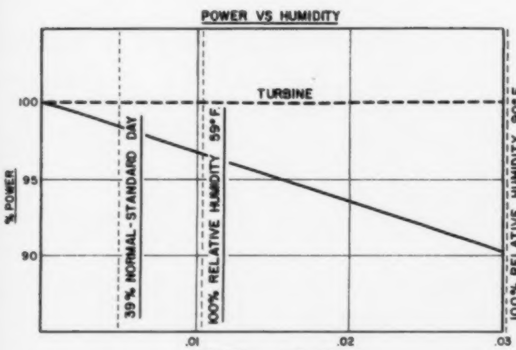
By way of explanation D/FSR has this to say: "When flying the R4D aircraft through heavy rain and power loss is experienced, it is advisable to place the carburetor air control in the filter position. On some aircraft, the location of the filter air intake as well as the filter itself serves as a water separator so that liquid droplets of water are removed from the air stream prior to entering the carburetor. If the ram air position is used in heavy rain, large droplets of water will be forced into the engine induction system. This could result in a loss of power. The power loss can occur from the following effects:

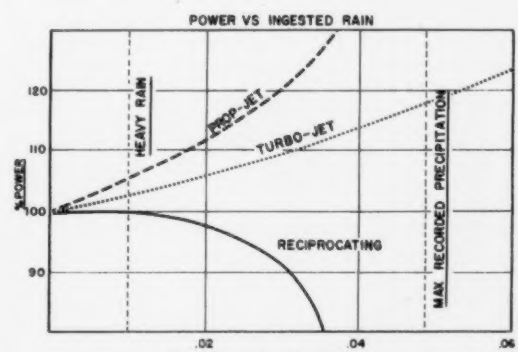
a. A portion of the dry air is replaced by water vapor.

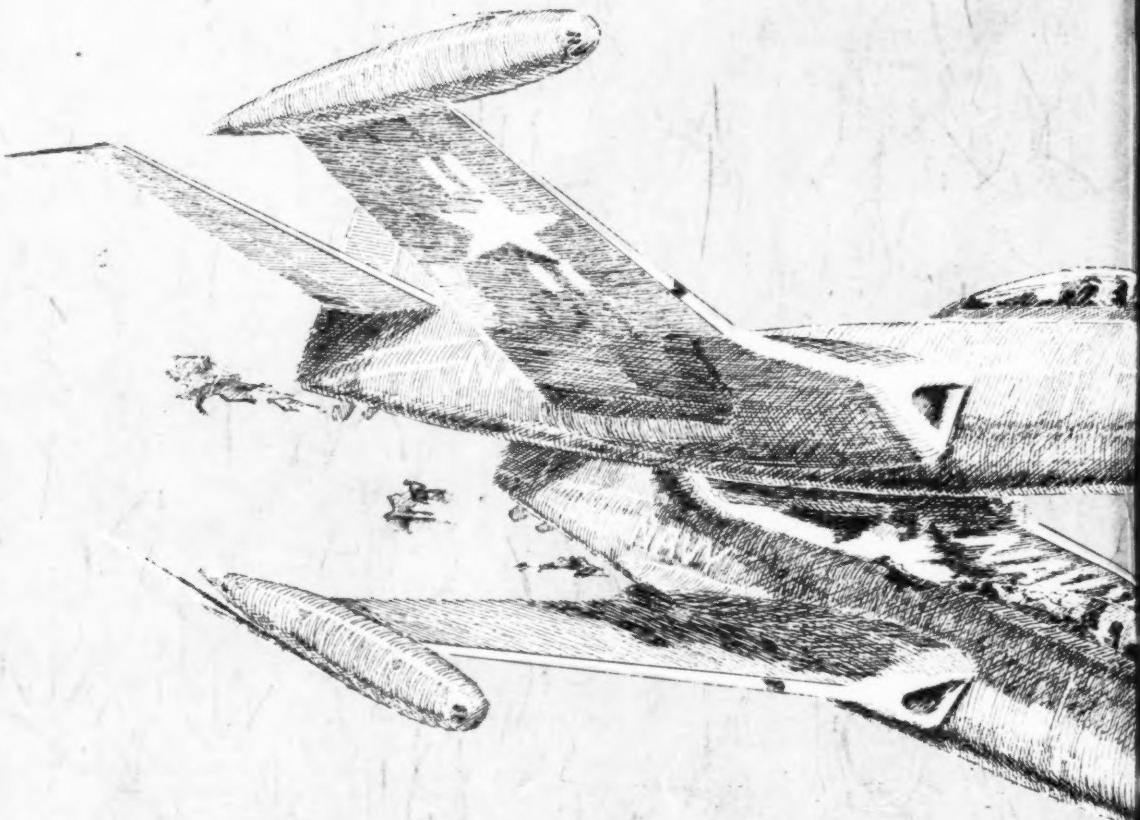
b. The fuel-dry air ratio is enriched above normal automatic mixtures.

c. The presence of water and water vapor in the combustion process affects the thermal efficiency of the engine. This effect is commonly known as "downing the engine."

—USAF Monthly FSO Kit







When two F2Hs collided in midair at approximately 30,000 feet, both pilots ejected through their canopies successfully and virtually uninjured. Here are excerpts from their narratives in the AAR:

KEEP YOUR DISTANCE!

LT—: I did not see the points of impact but felt a thud as if the underside of my port wing was hit. I immediately went on instruments and tried to regain control, but was unsuccessful in getting a proper response. I distinctly recall making two complete spirals during which time I was thrown forward against the shoulder straps with my navigational bag flying about the cockpit.

I tried reaching for my knee braces (to jettison the canopy) but was unsuccessful in my attempt. (Accident investigators surmised he had negative Gs at the time of ejection.) I then braced my head firmly against the headrest and grasped the curtain with my left hand and pulled. I ejected in what appeared to me as a horizontal angle. I expected the seat to separate in 4 to 5 seconds, but it didn't. I free-fell for approximately 20-30 seconds during which time I tumbled two or three times. I distinctly remember extending my hands to stabilize my flight but I don't know how successful I was. During my free fall I could see the horizon and the clouds below. I estimated my altitude at the time of seat separation to be 18 to 20,000 feet. I figured that I lost 6000 feet per spiral from 32,000.

I managed to release the safety belt lever and successfully separated from the seat. During the separation, I lost my helmet and received minor cuts about my face. A few seconds later, I found the parachute D-ring, pulled it and saw the parachute open. (*Manual seat separation necessitated manual parachute actuation.*) There wasn't too

much opening shock; in fact, I felt comfortable and punched my stop watch at the time of parachute opening. However, I forgot to stop it when I made my water entry.

From all accounts later, my altitude estimates were correct. I was conscious the whole time, collision to rescue, and can vividly recall each event.

I felt some snow flurries in my descent through the overcast. When I broke through the bottom of the overcast at approximately 3000 feet, I saw the fleet and the helicopter below—a consoling sight. I did not realize I was approaching the water as fast as I was until about 50 feet above it. At this time, I unlatched both my leg straps and pulled the right toggle on my mae west. (This was not good procedure. It is inadvisable to inflate your life vest before getting rid of the parachute and harness.) I kept my right hand on the chest ejector snap. When I hit the water, I unlatched my chest strap and separated from the parachute harness. However, my mae west became entangled with several of the shroud lines and my pararaft lanyard was still attached to the chute seat. I was initially dragged by the parachute face downward for about a half minute, a most uncomfortable feeling. I managed to roll on my back which I used as a surfboard and this gave me a comfortable feeling. I was dragged by the chute for approximately 5 minutes.

After my chute collapsed, I managed to detach the pararaft lanyard from my mae west. I also managed to free myself from the shroud lines so I swam 15 to 20 feet away. I realized that without a knife I could have a most difficult time if I tangled with the shroudlines. After further thinking, I swam back close to the chute in order to facilitate my rescue.

I had very good control over myself in the water —I did not experience any trembling in spite of the fact that my anti-exposure suit was filling up with cold water through the slits where the suit was cut in ejecting through the canopy. I did not use my pararaft as I thought my rescue would be almost immediate after my entry into the water. That was a mistake. Now I know different and recommend using the pararaft even though the helicopter is in sight.

I used the helicopter hoist without any difficulty. Once in the helicopter I experienced my first chills. While in the water, I thought that the sea was quite comfortable in spite of the 5- to 8-foot waves. In the helicopter I was placed in a horizontal position, which made the sea water in the anti-exposure suit cover my whole back. I had on my anti-G suit but was not wearing the anti-exposure suit liner. The chilling effects of the sea water which was approximately 70° and the vibration of the helicopter did not help the situation. The situation was further aggravated when they placed me in the stretcher on the flight deck with my head downward and with a strong deck breeze blowing . . .

Thinking back on my ejection, I would do things differently now. When I made the decision to eject, approximately 10 to 12 seconds after I was unsuccessful in regaining control, I elected to try the knee braces to blow off the canopy. Now after some thought, I do not think that this was good procedure inasmuch as I had had an impact on the airplane that might have warped the canopy track. If the canopy had stuck half way or partially, ejection through the canopy could have been dangerous. I think it should be a policy with all *Banshee* pilots to eject through the canopy in the case of a collision . . .

LTJG—: Someway I realized the aircraft was on fire and I ejected. I think that I probably saw the fire in the left canopy mirror. It seems to me that I remember seeing an orange glow up there. It caused considerable alarm on my part and I decided to eject as quickly as possible. I put both hands up to grab the face curtain. My left hand touched it first so I pulled the curtain with one hand and was clear of the aircraft.

I estimate that something less than 2 seconds elapsed from the time of impact to the time I was clear of the aircraft. When I first cleared the aircraft I tried to release myself from the seat, but I couldn't find the lap belt strap. Then I realized the seat had automatically released itself as it was supposed to. I rolled myself in a ball and abruptly spread my arms and legs out to full extension to stabilize myself. That stopped the tumbling and I became stabilized with my head down, my body at about 75 degrees down. The wind stream was chilling my hands and my face as I had lost my helmet and didn't have on gloves. (*According to the AAR, the large size APH-5 helmet was too small for this pilot. He was wearing an H-3 helmet, but the chin strap was so short it couldn't be snapped—a situation which could have been corrected by a parachute rigger.*) I tried to keep my hands warm by protecting one hand with the other so that I would be able to undo the parachute when I got in the water. I decided if the parachute didn't open by the time I hit the clouds (there was a cloud layer approximately 3000 to 8000 feet) I would use that as a guide to open my parachute. I located both releases for my parachute leg straps and also my chest strap release and had the D-ring tucked up close under my left arm where I could see it and get to it quickly.

My eyes were watering badly, either from the cold or due to the slipstream. I remembered an article that I had read about

an expert jumper who had said that you could turn yourself over in the air and stabilize yourself falling on your back by just sticking one arm out so I tried it and, sure enough, I turned right over and fell back first. I was still about 75 degrees head down. I found either falling face down or head down with only my legs spread out would stabilize me very firmly. Back first was much more comfortable and I could protect my hands from the cold air and my eyes were also protected.

I had lost my helmet, helmet liner and oxygen mask and was unable to get any oxygen from my bailout bottle. I had strained the muscles that operated my right arm and back to such an extent that I couldn't comfortably reach the bailout bottle or the hose. I was successful in using the grunt method of breathing and didn't come close at any time to blacking out from lack of oxygen.

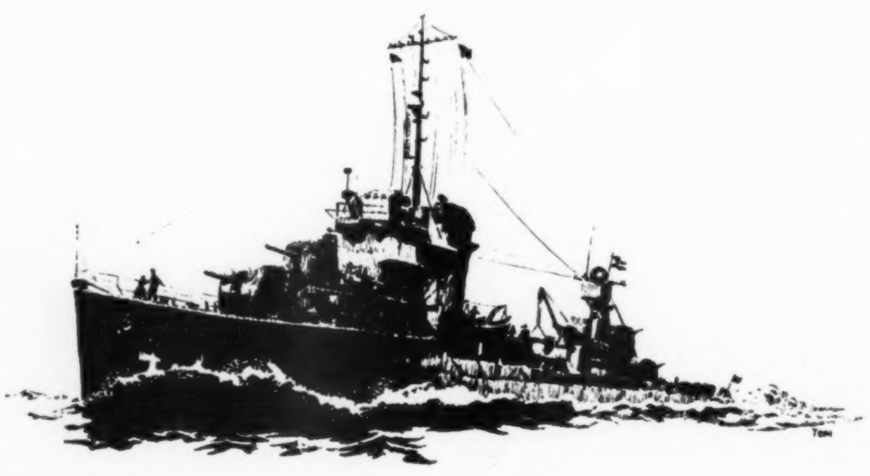
When the parachute opened, I was falling in a relatively comfortable position on my back. There was an explosion and a snap and the parachute opened almost instantly. I was still in the clouds so the parachute must have operated at its set altitude. I realized that I had my head through the left set of risers instead of between the risers as it was going out through the same hole as my left arm. I pried the riser apart and got my head back in where it was supposed to be. I had a smooth ride the rest of the way down. It was snowing in the clouds; however, it was not bad enough to cause much discomfort. Just as I broke out of the clouds, I observed three ADs in formation orbiting the spot where I would hit the water. I also saw a burning oil or gasoline slick which I presumed was my aircraft. About 15 or 20 seconds later I saw a *Banshee* descending in a 35-degree dive out of the clouds behind the ADs. It pulled up in a tight left turn and went back into the overcast. I could just barely see it through the haze. I saw its left wing drop sharply and it fell into a tight spin and went straight down into the water and sank out of sight almost immediately. This was the first time that it occurred to me that I had had a midair collision rather than a failure of my aircraft.

Shortly after breaking out of the overcast, I noticed a plane guard destroyer coming up the starboard side of the carrier and cutting across the bow. Shortly after that I was in the water. I saw the water coming up and was able to estimate accurately when I would go into it. I went in facing in the direction of the motion. I had my chest strap unbuckled and my leg straps

buckled and the life raft lanyard fastened to my mae west. When I went in the water I held my breath just before I hit and immediately popped back up. I had just a second or so to realize that I was floating nicely and then the parachute started dragging me along in the water face down.

The risers coming from my back pulled me with my head under the water and I had a great deal of difficulty to get up to get a breath of air. I swallowed a great deal of salt water. First I started pulling in on the top risers and then I realized I had the wrong ones and started pulling in on the bottom risers. I pulled them in all the way to the shroud lines. As I couldn't pull the shroud lines in very well, I held them at that point hoping that the chute would collapse. I could see it out in front of me and every once in a while it would come down to where it was half in the water and then pop back up and drag me some more. As I was taking a lot more water than I liked, I rolled over on my back and, sure enough, that acted kind of like a water ski and kept my head completely out of the water. I stayed on my back quite comfortably still holding the bottom risers until the chute finally collapsed. I was being supported in the water by the air in my anti-exposure suit. My left knee had been cut when I ejected through the canopy and the bottom of the anti-exposure suit had filled with water. I was not wearing the liner but was wearing the anti-G suit. I wasn't in any danger of having the air in the bottom of my anti-exposure suit float me feet up. At this time I realized that I had not inflated my mae west so I carefully reached down and picked out the toggles for the CO_2 bottles and pulled them. I had become entangled with the shroudlines. I was trying to free myself from the parachute and at the same time pull the raft lanyard in towards me to get the life raft when I saw the helo heading my way.

I thought that I was free of my parachute so I pulled out a distress signal from the right side of my mae west and by holding it against my chest with my bad arm, I was able to pull the ring on it and ignited it. I held it and the helo saw me and came over and lowered the sling to me. I put the signal back in my mae west in case I had to use the night end of it. Meanwhile I had gotten my right arm entangled in a shroud line so I waved him to come back in and he lowered the sling to me again. While climbing into the sling I must have released it from the line because it came completely free from the lift cable. Then he brought the weighted line back over to me and I snapped the sling back on and crawled into it



. . . the destroyer arrived on the scene but it went by me . . .

and then signaled him that I was ready to be hoisted up. He got me pretty much out of the water but one of the shroud lines had hooked around my leg and I still had my pararaft lanyard hooked to my life vest. The crewman was motioning to me that I had something hooked around me. I could feel that I was very heavy due to all the water that I had in my anti-exposure suit so I was put back in the water and I crawled out of the sling and the helo left me. I found out later that it left me to pick up LT— who was a couple of hundred yards away from me. About this time the helicopter crewman dropped a smoke flare but it failed to go off.

A few minutes later the destroyer arrived on the scene but it went by me. I lit off the second distress signal from my mae west and held it up. Then I observed that it was dripping a tarry stuff on my hand. I couldn't feel it but apparently it was burning a large area on my hand so I dropped it.

Since I didn't have any more day distress signals and I thought that the destroyer didn't see me, although it was no more than 100 to 200 feet away, I swam over to the smoke light that the helicopter had dropped thinking that I might be able to ignite it. Although the igniter ring had been pulled out of it, the smoke light hadn't gone off and there didn't appear to be any way that I could get it lit off. While swimming over to where the helo had dropped the flare, I noticed the destroyer had come around and was making another run on me. I waved and they waved back so I knew that they saw me. The destroyer came alongside me and they threw three lines from the bow out to me.

By this time I was getting pretty stiff from the cold water though it had seemed like pretty warm water after falling through the cold air. Now I was beginning to become chilled and was getting stiff. I couldn't get to the lines though they were only three feet away from me. About the same time that they threw the three lines off, a crewman in a life jacket jumped off the bow of the destroyer and swam over to me. He wrapped a couple of lines around me under my arms and legs and feet.

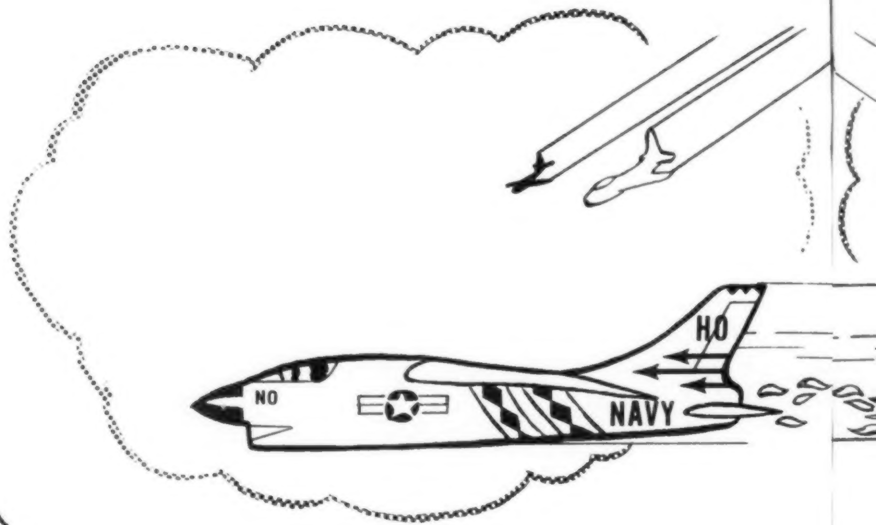
Then I drifted back by an opening in the gunwales of the destroyer where they dropped a bosun's ladder over the side. The sea was running five feet or so as they tried to get me aboard; it wasn't working out too well. I got over close to the bosun's ladder and when it took a particularly low dip in the water I got a good hold on it and ended up hanging on to the ladder about two feet below the deck of the destroyer. They had three people pulling from the deck, but I still had water in my suit and it was all that I could do to hold on to the ladder. I figured that my weight plus the weight of the water in my anti-exposure suit was in the neighborhood of 350 pounds. They pulled me up and put me in a stretcher and carried me into sick bay.

AAR Recommendations

Among the recommendations in the AAR concerning survival techniques and personal equipment are:

- That close supervision be maintained in the periodic inspection of pilots' personal equipment to see that up-to-date equipment is used and that available equipment is used properly.
- That gloves be worn for protection from flash burns.
- That a liner be worn when the anti-exposure suit is worn.
- That a knife be carried on the exterior of the anti-exposure suit.
- That a pilot use his pararaft even though rescue may seem imminent.
- That a pilot not fight his chute in the water if his water entry is made with parachute buckles still hooked and he is being dragged . . . that the pilot roll over on his back in the water and effect separation from harness if possible or remain on his back until chute collapses.
- That a pilot make sure he is completely free from parachute harness, shroud lines and pararaft lanyard prior to entering the helicopter rescue sling or mounting the helicopter rescue seat.
- That downed airmen use all available signaling devices—distress signals, dye markers, . . . to attract the attention of rescuers no matter how close rescue facilities are. Spotting a pilot in rough water is very difficult even from a helicopter.
- That a more realistic program be devised for training aviation personnel for escape from a parachute after a water landing such as, for instance, a tower so that pilots could actually be dropped into the water and practice escape from an opened parachute under rough water and high wind conditions.
- That all survival training programs be continually reviewed and stressed by all aviation commands. A sound, practical and realistic survival training program within this squadron definitely contributed to the successful ejection and subsequent rescue of the two pilots involved in this accident, the AAR states. Both pilots demonstrated knowledge and confidence in using their survival equipment even though they didn't make the maximum use of all equipment available. ●

ANYMOUSE | AN



WHO,

My SECOND hop of the day consisted of a ready CAP over the small-type carrier. The wingman and I had made about four orbits and began to get bored. Then, a photo F8U called and reported power troubles.

He said his airspeed indicator was erratic and that he was using an abnormal amount of power for his altitude of 32 thousand. I volunteered to join up and check his afterburner eyelids for possible trouble and also to check his airspeed. The photo F8U began a right-hand orbit over the ship at 32 thousand feet while I headed for a rendezvous.

His position was to be on the 180-degree tacan radial, close in to the ship, and my wingman picked up a contact at this spot. I got a visual sighting and we closed on a photo F8U at about 30 thousand. It was in a turn, so everything matched: orbiting photo F8U near 32 thousand at the 180-degree radial near the ship—this *had* to be the plane in trouble. Unfortunately, it wasn't. And needless to say, I now know the merits of positive identification and I will never laugh again at stories about coincidence and unusual circumstances.

The plane I joined was another photo F8U with similar markings, but, from a different carrier. "My" F8U (as I endearingly call him from now on) was at about 200 knots, nose cocked up. After yo-yoing about his aircraft a couple of times I asked if he saw me. I heard the reply, "Yes." Here it gets confusing but interesting. Actually, as I asked my question the F8U in trouble had been intercepted by two other aircraft which were looking for a hassle. He answered "yes" because he assumed the two air-

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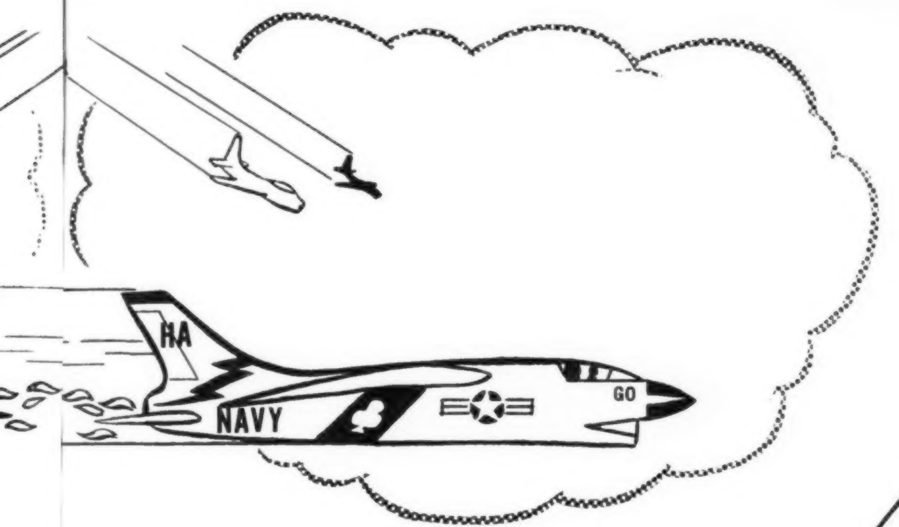

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on) nose bout imes eard gets Ac- tion been air- or a be- air-

craft were myself and my wingman.

So now I eased up to the stern of My F8U to check on his afterburner. His nozzles were open and he was losing altitude. I told him to add power. The F8U in trouble replied that his altimeter indicated 32,000 but it might be a malfunction in the pitot system. But now the F8U which I was following really started dropping down and so did my heart. He was probably making an idle descent to his carrier, which by coincidence was 10 miles from our carrier.

I was convinced that I had the correct aircraft in sight and that he was in trouble. I followed him down, frantically telling him to put on more power and level off. After hearing these instructions the F8U in trouble was convinced he *had* terrible trouble and added power like mad.

Meanwhile the small type carrier was listening to the conversation and things were in confusion. The flight deck was cleared for an immediate landing and Air Ops was debating whether they should order the F8U pilot to eject.

I followed My F8U below the cloud layer and he finally leveled at 600 feet. The ship asked the F8U in trouble what his position was and he replied that he was above the clouds. That did it! I frantically told My F8U, "Negative, you are below the clouds!" By now I was positive he had hypoxia and oxygen trouble and told him to hit his bailout bottle or take off his mask. My F8U and I were headed toward a carrier; he knew it was his but I thought it was my small-type roost.

Hysteria and confusion hit a new high with my next transmission. "Do you see the car-

rier," I asked. "Yes," the F8U in trouble answered, "it's way down below."

"Negative. It's dead ahead!"

Exasperated, I closed to a beam position and told My F8U to take off his mask. The F8U in trouble said he couldn't because he had a high-altitude helmet on. I was alongside now, and looked more closely at My pilot and at his side number. The pilot I was staring at was wearing a standard helmet and the side number did not belong to an F8U off my carrier. A small flicker of recognition blossomed into a white-hot cauldron of comprehension. I sat there stunned and speechless. I didn't even have to look to know the carrier we were approaching was a large-type and not my small-type home.

I mumbled my apology, broke off, and couldn't decide whether to ditch now or just fly over the horizon into oblivion. My face was red enough to be mistaken for a fire-warning light.

At this time the F8U in trouble was not sure whether he had hypoxia or not. He had his visor up and was rubbing his face and was on the verge of taking his gloves off to check his fingertips for possible blueness. The same two aircraft (still looking for a hassle) who had seen him originally intercepted him again. The poor guy was now at 41 thousand feet, and still climbing (a result of my insisting that he was losing altitude).

When things were explained the F8U in trouble came on down and got aboard safely. I also got aboard but my experience was not over and I had to endure the jeers of my shipmates.

See what I mean when I commented on the merits of positive identification? The boys haven't bought me a seeing-eye dog yet but from the looks I get I expect that is next on their agenda.

Rain or Mud Freddie Flies Tonight!

ALL proficiency pilots who find themselves in the cockpit with a stranger should be interested in an experience I had not long ago.

Since I needed flight time and was interested in getting some multi-engine time I was pleased to be scheduled for a long night cross-country in an R4D-6. I was assigned the idiot seat and under the circumstances was not too curious about who signed out for the left seat.

I got both the flight time and multi-engine experience the hard way—The pilot turned out to be "Frightless Freddy" who was long on experience but short on common sense. On the leg from Anacostia to Jax we were good samaritans and agreed to drop off some passengers at Aberdeen, Maryland. While filing for our Anacostia departure a squall line passed and being conscious of the late afternoon hour, I listened, looked, and checked more closely than usual as the metro man gave his pitch. It looked grim.

I informed Frightless Freddy of my misgivings but he replied, "We can get through VFR, I always have." Later I realized this was a clue I should not have ignored. Way down I knew better but deferred to his log book and plane commander designation.

An uneventful hop to Aberdeen calmed me temporarily and we bored southward out of the Washington area at 2500 feet under a 3000-foot ceiling, with 5 miles visibility in light rain. I suggested that we file IFR and Frightless' answer was to descend to 1500 feet, a second clue which I ignored.

Approaching the Potomac river, the ceiling was down to the top of our fuselage, the visibility was down to two miles and the windshield was leaking badly. I was nervous but 'ole Frightless assured me we'd soon be through it. The third clue I ignored was the fact that I knew we wouldn't pop back into flyable VFR conditions.

Near Coles Point we approached the blackest-looking line of TRWs I've seen in many a day. Frightless appeared to be a little uneasy. I suggested that we orbit in a little patch of sunshine to the northwest and wait for an IFR clearance and this time he agreed. So head down and locked, pencil in hand, I started to compute and called Richmond radio. (I didn't want Washington Center to know we were anywhere around unless they had to.)

Just as I called Richmond the lightning flashed, the thunder cracked, the rain came down in buckets, and the old R4D commenced a series of wild gyrations which were to last for 90 minutes. Frightless had bored in where angels fear to tread; IFR on a VFR clearance no less. I had a brief mental struggle with myself as to whether I should take command and take that evasive action known as a 180 but I was not an R4D plane commander. As we rapidly got into a position where it was a case of raw survival, I forgot my Caine Mutiny feelings and just tried to help.

Between moments of sheer panic I managed to pass my clearance request to Richmond, though it took me almost all the way from Coles Point to RIC to get it straight. A few miles past RIC we got the clearance—now we were legal. I'll never know why we weren't asked our flight conditions (IFR or VFR) because every station for miles around was reporting severe TRW and it should have been pretty obvious to everyone that we were breaking some rules. Perhaps ATC was just glad we got in touch with them.

Following the readback, I settled down to help Frightless, and he sure needed help. At one

point I read 75 knots on the airspeed indicator. A quick check of the gyro horizon showed an extreme nose up position. As I jammed the yoke forward I yelled, "Get your nose down!"

Frightless gave an equally hard jerk aft and yelled back, "I'm trying to get on altitude!" We were indicating 3000 feet and our assigned was four.

Again I jammed the yoke forward. "The devil with the altitude, get the attitude! We're the only crazy *#$@@'s out tonight!"

So for 90 minutes we bored through the center of a squall line. This was an idiotic maneuver even on an IFR clearance, but for 30 of the 90 minutes we were on a VFR clearance. You say there's no such thing as a 90-minute wide squall line? There is if you parallel it, and that's what Frightless Freddy and I accomplished that night. It is small claim to fame.

We suffered from extreme turbulence, constant lightning, torrential rain, and weak kidneys. Our altitude varied from 2500 to 7000 feet, and at one point our crewman, a salty old chief, appeared in the cockpit, harness and chute cinched up tight, and asked me if it was time to abandon ship.

In preference to things like this I think I'll almost be glad to get back to single-pilot night cat shots with no horizon. ●

WHIZ QUIZ

1. When jet RPM is reduced from 100% to 80%, thrust is reduced to (a) 80%, (b) 70%, (c) 50%, (d) 60%.

2. At what time are scheduled weather broadcasts made by FAA stations?

3. What is the accepted terminology and abbreviation for fueling aircraft in flight?

4. In the lift formula for an aircraft wing, lift varies:

   a. directly with velocity

   b. inversely with velocity

   c. directly with velocity squared

   d. inversely with velocity squared

5. You're lost and have no radios; in which direction do you fly the triangular distress pattern?

6. How long should you continue the triangular pattern?

7. How long should the triangle legs be?

For the correct answers please turn to page 47.

HEADMOUSE

Have you a question? Send it to Headmouse, U.S. Naval Aviation Safety Center, Norfolk 11, Virginia. He'll do his best to help.

Wants Quality Control Info

Dear Headmouse:

. . . One of our major objectives is to have the best maintenance and finest quality control available. We have had difficulty finding enough background material concerning quality control.

BuWeps Instruction 5440.2 has the organizational information but does not contain enough details for this command to establish the training syllabus in quality control that it desires. The maintenance portions of APPROACH and "Crossfeed" contain a good many specific instances of maintenance malpractice and poor quality workmanship. It is believed however, that this command and perhaps others could use more information on quality control systems.

It is requested that NASC publish a pamphlet on the basic concept, theory and general quality control.

E. H. MOYER
C.O. HU-4

NAS Lakehurst

► This matter was referred to BuWeps for action. BuWeps Notice 5440 of 9 Sep '60 advised that the subject instruction is in the process of being revised.

Comments for proposed revisions have been requested and received from selected fleet units and CNAL/Pac. These are to be incorporated into the revision. In the meantime APPROACH has received a number of quality control reports from various fleet units.

A cross-section of concepts and philosophies appear in this issue beginning on page 4.

Very resp'y,

Headmouse

Fuel and Power Settings

Dear Headmouse:

I would like some information for myself and for some others who I hope will read this. The power settings for the R4D-8 in the Flight Manual are figured with the use of 100/130 fuel. In actual operation we use 115/145 fuel. Using the power settings for the R1820-80 engine with a PD 12K18 carburetor, what power settings should be used?

I have seen RPM and MAP juggled from one Plane Commander to the other and some heated arguments have developed as each person interprets the charts to suit himself.

I would like some good hard figures so there can be no more arguments as to what is right.

GYSGT CREW CHIEF

Beaufort, S. C.

► Wright Aircraft Engines Military Cyclone 7 & 9 Models Operating Instructions dated Feb 1960, Section II, page 2, regarding R1820-80 engines and 100/130 fuel states: "Higher grade fuels than those approved for each model may be used, providing the same power limits as set forth for the approved fuel grades are observed."

Very resp'y,

Headmouse

Angle of Attack Settings

Dear Headmouse:

My C.O. and I got into a discussion the other day about angle of attack indicators in various aircraft as to their unit setting for the landing configuration. We were wondering about the newer jet aircraft if the angle of attack indicators were adjusted to give a standard reading, say of 20 units. For example, the F3H which has a relative nose-high landing attitude and the F8U which has a relative nose-low landing attitude, would the angle of attack indicator in each aircraft be adjusted to give a standard reading for the correct landing attitude?

DON G. DE LUCA, ENS.
UTILITY SQUADRON ONE

FPO, San Francisco

► The angle of attack indicators are not necessarily set to give a standard reading of the same number of units for different model aircraft. However, it is standard procedure to set the indicator in such a manner that the desired number of units on the angle of attack indicator will always appear at the 3 o'clock position on the instrument. Thus while the actual angle of attack will vary for different model aircraft, the desired angle of attack for landing will appear as a specific number of units at the 3 o'clock position on the indicator.

Very resp'y,

Headmouse

Asymmetrical Reversing

Dear Headmouse,

Request background information concerning par. 2B, NavAvSafCen 271600Z, concerning recent P2V accidents.

We have had included in our P2V-5F and 7 syllabus, instruction in the use of asymmetrical reverse thrust. The procedure that we utilize is based upon Jay Beasley's article, *Landing the P2V*, and upon info gained during his recent visit to our command.

We like the procedure (which we would be glad to provide) and consider it an integral part of our training. We have, however, discontinued the practice pending additional information from NASC.

The paragraph covering the subject in sect. III of the P2V-5F and 7 manuals seems inconsistent with the teachings of Mr. Beasley, the experience of this command, and with the Stopping Distance Graph

for single engine reverse which indicates approximately 25-28% runway savings when used.

As to the potential hazard of the practice, it is considered that a greater hazard exists by not practicing a procedure which when utilized under stress and without prior training has the capability of turning an emergency situation into a serious accident.

GEORGE R. CARLSON, LCDR
Safety Officer, VP-31
San Diego

► *CDR John J. Foley, VT-31 requested the same information. The following is an attempt to provide the same:*

The word "practiced" may have been a bad choice—we meant to imply that there might be a time and place to use it.

Most letters concerning the article "Landing the P2V" have had good things to say about Mr. Beasley's procedures except for the regular practice of reversing the good engine during single-engine landings.

Literal interpretation by inexperienced pilots can lead to trouble.

One difference of opinion was stated: "For my money the best bet is to lay off the reverse pitch unless you are definitely running out of runway. Many a landing has been botched by the improper use of reverse pitch. A well executed single-engine landing still gets no bouquets if the aircraft ends up in the boondocks because it swerved off the runway on a rollout. Brakes alone will generally do the job on most runways we operate from today."

We have great respect for Mr. Beasley's ability and we like his article. A few minor differences of opinion on specific Navy operating problems in no way detracts from the great benefits which accrue to Lockheed and the Navy from our mutual cooperation. His procedure of reversing the operating engine is a good one. However, young pilots should not take it or the stopping distance graph too literally.

When Mr. Beasley demonstrates the procedure, he is working under ideal conditions while our young PPCs may find themselves returning single-engine to a wet or ice covered runway, with low ceiling and a crosswind but enough runway to roll out on if they concentrate on a good approach and touchdown. The tension builds up faster in the young pilot, while Mr. Beasley in a similar situation could be expected to draw on his more than 25 years of experience. We could expect him to remain his relatively calm, easy-going self and therefore he would analyze his situation and do a good job. He might not use reverse thrust in some cases.

P2V Aircraft Accident Summaries have listed accidents which indicate that directional control was lost after reverse pitch was used; i.e., "Reverse thrust was used on the port engine. The aircraft left the runway 3800 feet short of the upwind end of the runway and stopped half submerged in water." Such cases led to the conclusion: "That single-engine landings may be executed without using reverse pitch during landing rollout. Case histories have indicated that the use of reverse pitch on one engine, with the other propeller feathered, only creates a definite groundloop hazard and is of little value in slowing the P2V aircraft." As you probably know this quote together with the most common errors made during landing accidents, is quoted in Section III of the P2V-5F and -7 Pilots Flight Manuals. The same errors are still present in recent accidents, paricularly: "landing fast and long" and then applying reverse thrust to stop on the remaining runway. It may be that pilots become sloppy in their approach because they have made it a practice to depend upon reverse on almost every landing they make.

The cases on record reveal that our pilots are falling into the very traps that Mr. Beasley warned us about, namely:

1) Failing to make sure the propeller goes into reverse before applying any appreciable amount of power.

2) Failing to make full use of the rudder to offset the effect of reverse thrust.

3) Using too much brake too early in the landing rollout.

4) Using too much power in reverse.

Mr. Beasley points out that "as the airspeed is reduced, reverse thrust and rudder effectiveness diminish somewhat proportionately." Thus the amount of power that can be used in reverse will depend upon the effects of: full opposite rudder, nosewheel steering, differential braking and the effect of crosswind. In most cases where the runway is slick, the power that can be applied is of low order and can be used for only a short duration. So after comparing the hazards involved with the amount of slowing effect, we recommended that asymmetrical reversing not be practiced.

However, the use of differential power, either in reverse or forward thrust, is good practice for countering crosswind effect, or swerves, if properly applied.

Very resp'y,

Headmouse

Answers to Whiz Quiz, page 45.

1. c
2. 15 and 45 minutes past the hour, with the first covering stations within a radius of 150 miles, and the second cover sequences on the airways within 400 miles.
3. Air Refueling (AR)
4. c
5. left
6. minimum of two patterns, then continue on course, repeat pattern at 20-minute intervals.
7. 1 minute for jets, 2 minutes for props.

GROUND ACCIDENTS-*from flight surgeons' reports*

Canopy Closes

THREE Marines assigned the task of swinging the compass on an F9F-8B completed the aligning just as a heavy rain shower began. The ACPL in the cockpit secured the engine.

As soon as the engine stopped turning, a second ACPL climbed up to the cockpit on the port side to call the tower for clearance back to the hangar. He leaned over the left canopy rail, picked up the headphones from the left console and put them on. Then he leaned across the cockpit to make sure the radio was on. As he did so, he heard a whining sound, then felt the canopy closing on his lower chest. He tried to reach the canopy control lever but couldn't.

Realizing what had happened, the ACPL in the cockpit moved the canopy control lever aft, but this had no effect on the canopy. He then actuated the electric hydraulic pump, and the canopy moved aft releasing the accident victim. It was estimated that the canopy had lacked approximately 8 inches from closing completely.

The ACPL suffered internal injuries necessitating emergency surgery. He will be on the sick list an estimated 40 to 50 days.

"The canopy control lever in the F9F-8B is in an ideal location for accidental actuation (while either leaning over into the cockpit or while getting into the cockpit) provided there is sufficient pressure in the hydraulic system," the reporting flight surgeon states. "Had this man paid close attention to avoiding the control lever as he reached across the cockpit the accident probably would not have occurred."

A similar ground accident took place in which an AO3 seated in the cockpit of an F9F-8B to operate the switches for loading ammunition stood up, inadvertently engaging the canopy handle. The canopy closed, wedging him between the forward edge of the canopy and the windscreen. He shouted for help and the canopy was opened externally. He sustained minor injury.

Comment: The frequency of this type of occurrence indicates that a renewed educational program is required by all F9F users.

Haste Makes Waste

WHILE servicing an R4Y-1, a ground crewman slipped and fell off the trailing edge of the inboard section of the starboard wing. Oil on his shoes caused him to lose his footing on the smooth wing surface as he jumped from the trailing edge to the pavement. As he extended his hands to break his fall, his left wrist was fractured. Current instructions in his squadron directed that servicing ladders which are part of each airplane's equipment be used for access to wing surfaces. A second man should hold the ladder.

This steel-toed flight boot saved a pilot's foot. As he preflighted his F8U being spotted for catapult launch during an air defense exercise, the starboard wheel ran over his boot. *His only injury was a sprained ankle.*

(This was the second such incident reported in a matter of months. While refueling an R4Y-1 at an Air Force Base, the plane captain used a 12-foot non-folding aluminum ladder from an AF gas truck to climb on top of the starboard wing. When he started down, the base of the ladder slipped. He fell 9 to 10 feet to the deck and sustained broken bones in his arm and heel.)

Non-Approved Method

A P5M-2 just back from an ASW flight was approaching the ramp buoy. The bowman reached down and grasped the line from the buoy to slip it onto the bollard in the usual fashion. Instead of grasping the buoy line with his fingers, he slipped his right arm into the bight. The aircraft continued moving forward and the line became taut. He became aware of the increased tension but before he was able to extract his arm, the bight was pulled behind the hatchway and his arm was pressed against the edge. Both bones in his forearm were broken.

Investigation disclosed that the faulty technique used by the bowman for mooring the aircraft on its approach to the ramp buoy was "an idiosyncrasy peculiar to this individual." He was fully aware that he was using a non-approved method, the incident report states, but he continued using it.

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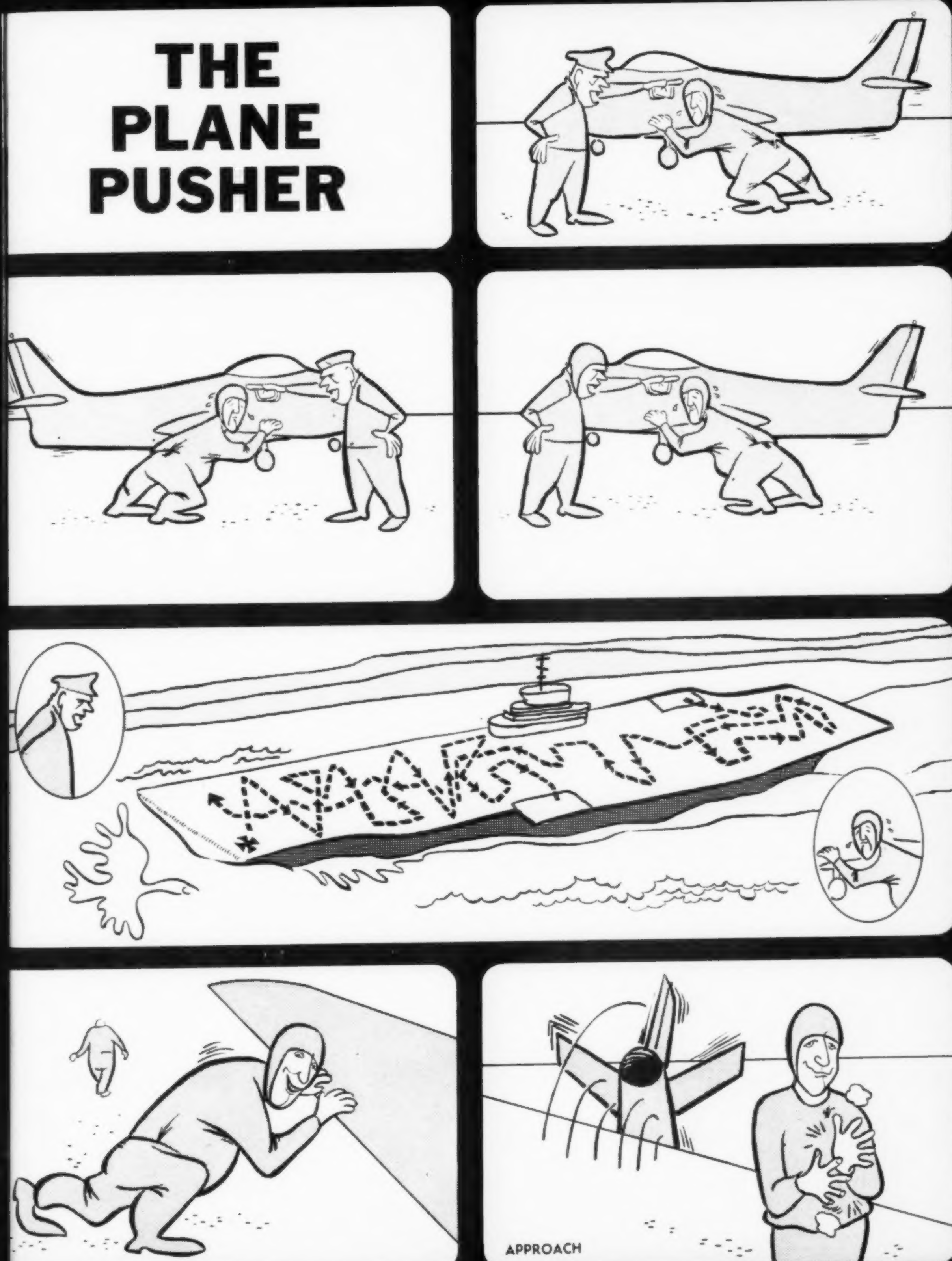
THE PLANE PUSHER
APPROACH

GROUND ACCIDENTS--A SMALL MATTER?

DON'T YOU BELIEVE IT! HERE'S THE RECORD FOR THE LAST SIX MONTHS OF 1960—

148 GROUND HANDLING ACCIDENTS
176 AIRCRAFT DAMAGED
3 PEOPLE KILLED
8 PEOPLE INJURED
36 AIRCRAFT WITH MAJOR DAMAGE
$2,234,000.00 LOST

GROUND ACCIDENTS CANNOT BE CONSIDERED INSIGNIFICANT. THEY SERIOUSLY REDUCE

FLEET READINESS

IT'S HIGH TIME WE USE THE EXPENSIVE LESSONS LEARNED FROM THESE MISHAPS.

PREVENT-A-CRUNCH